3

SAFETY EDUCATION IN THE SECONDARY SCHOOLS

OBJECTIVES AND MATERIALS OF INSTRUCTION

By

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SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN THE FACULTY OF PHILOSOPHY, COLUMBIA UNIVERSITY

PUBLICATIONS OF THE NATIONAL BUREAU OF CASUALTY AND SURETY UNDERWRITERS
EDUCATIONAL SERIES, VOLUME IV

PRINTED BY
L. W. LAWRENCE
38 LIBERTY STREET
NEW YORK CITY

ACKNOWLEDGMENT

I wish to acknowledge my indebtedness to those whose assistance has made it possible for me to undertake this study. First of all, special acknowledgment should be made to the National Bureau of Casualty and Surety Underwriters and particularly to its Associate General Manager, Mr. Albert W. Whitney, for providing the graduate fellowship under which this study was conducted. I am also grateful to the following persons who have so generously given me of their time and help: Mr. Lewis A. De Blois, Director of Safety Engineering in the Bureau; Miss Idabelle Stevenson, Miss Florence Nelson, Mr. Sidney J. Williams, and other officials of the National Safety Council.

Acknowledgment should also be made to members of my committee at Teachers College, Columbia University: Dr. Percival M. Symonds, Dr. Thomas D. Wood, Dr. Harold O. Rugg, and Dr. Elbert K. Fretwell. The members of this committee and others on the faculty of Teachers College have always willingly assisted me with advice and criticism. I am also grateful for the work that has been done by teachers, principals, and managers of local safety councils in administering and scoring tests.

Finally, I wish to express my appreciation to my wife who has been occupied in keeping my home and children safe, while I have been away writing about safety.

H. J. S.

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CHAPTER I

THE IMPORTANCE OF SAFETY IN OUR MODERN INDUSTRIAL CIVILIZATION

Modern civilization has given rise to many different hazards of life that were comparatively unknown a century ago. The development of industrial machinery, the rapid increase in the use of motor vehicles, the introduction of air transportation, the manufacture of dangerous chemical substances—all of these have introduced new dangers into our life today. The hazards of our environment are constantly changing. From 1911 to 1927 the fatalities resulting from motor vehicle accidents have increased 1050 per cent.[1] On the other hand the number of fatalities in railroad accidents in the eight year period from 1920 to 1928 has decreased over 6 per cent and the number of passengers killed on railroads has decreased 63 per cent.[2]

While the death rate from certain diseases including typhoid fever, malaria, smallpox, measles, scarlet fever, whooping cough, diphtheria, tuberculosis, diarrhea and enteritis, puerperal septicemia, and puerperal albuminuria—has decreased from 305.1 to 140.3 per 100,000 population from 1913 to 1927, the death rate from accidents has changed only slightly during this period and from 1921 to 1927 has increased from 68.7 to 78.4 per 100,000 population.[3] It is apparent that education and prevention methods used in connection with health programs have achieved a very definite result in the reduction of the death rate from these diseases, but that today special stress needs to be placed on the prevention of accidents.

The importance of accidents is even more marked during the period of school age, in which we are particularly interested in this study. According to the Mortality Statistics, in 1927, there were 93,078 fatal accidents for all ages in the United States, of which 9,769 were individuals between the ages of 5 and 15 and 15,757 were between the ages of 5 and 20.[4] Table I and Figure 1 show the importance of certain accidents as causes of death at various ages. It is evident that the upward trend of the curves for certain accidents in the period of secondary school age is an indication of

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[1] National Safety Council. *Accident Facts, 1928*, p. 7.
[2] National Safety Council. *Accident Facts, 1929*, p. 39.
[3] *Ibid.*, Table 8, p. 12.
[4] From a photostat of the Mortality Statistics of the Census Bureau for 1927.

TABLE 1

CAUSES OF ACCIDENTAL DEATH IN CONTINENTAL UNITED STATES BY AGES—1927*

Causes	Total	Under 5	5–9	10–14	15–19	20–24	25–29	30–34	35–44	45–59	Over 60	Unclass.
GRAND TOTAL	83,408	8,150	5,126	3,647	5,377	5,966	5,074	4,876	10,609	13,848	20,460	275
1. Poisoning by food	748	227	58	29	25	27	25	26	88	112	130	1
2. Poisoning by animals	88	39	5	6	4	4	2	3	6	5	14	..
3. Other poisoning	1,608	542	48	7	41	86	92	112	260	273	146	1
4. Conflagration	1,496	345	145	62	52	70	83	87	163	216	265	8
5. Burns (conflagration excepted)	5,937	2,223	691	213	196	248	221	233	461	539	901	11
6. Mechanical suffocation	1,107	828	21	28	14	21	29	21	63	61	21	..
7. Asphyxiation by gas	2,510	55	23	30	79	141	147	143	430	721	741	..
8. Drowning	7,246	599	653	865	1,111	787	489	433	829	936	452	92
9. Firearms (except in war)	2,647	112	171	384	552	302	241	176	320	261	119	9
10. Cutting or piercing instruments	672	68	49	31	31	31	26	27	84	149	176	..
11. Falls	14,913	533	313	224	257	322	335	413	1,136	2,036	9,330	14
12. Mines	2,688	1	..	3	164	362	369	326	742	581	136	4
13. Quarries	142	1	3	3	13	11	13	15	31	39	12	1
14. Machines	2,072	33	45	49	149	228	220	211	416	469	249	3
15. Railroad Accidents	6,794	131	163	217	514	675	602	564	1,295	1,496	1,079	58
16. Collisions with automobiles	1,664	68	64	61	187	209	157	140	288	326	162	2
17. Other railroad accidents	5,130	63	99	156	327	466	445	424	1,007	1,170	917	66
†18. Street car accidents	1,427	60	45	30	67	96	95	107	210	351	365	1
‡19. Automobile accidents	20,704	1,294	2,240	1,026	1,461	1,707	1,356	1,204	2,551	3,620	4,219	26
20. Airplane or balloon accidents	204	..	2	1	15	50	61	33	28	12	..	2
21. Injuries by other vehicles	1,342	81	108	80	112	110	58	55	122	261	353	2
22. Crushing accidents	756	11	28	16	48	58	80	80	168	165	101	1
23. Injuries by animals	548	45	38	47	21	27	8	29	57	105	171	..
24. Excessive cold	257	6	5	1	8	6	9	3	32	69	114	4
25. Excessive heat	519	69	3	4	11	20	10	27	91	138	146	..
26. Lightning	348	3	14	35	45	42	26	34	56	64	28	1
27. Electric shocks	970	6	15	24	88	176	170	145	194	127	23	2
28. Fractures	640	11	9	5	16	18	22	33	85	126	308	7
**29. All other external violence	5,025	827	231	227	283	341	285	336	691	916	861	27

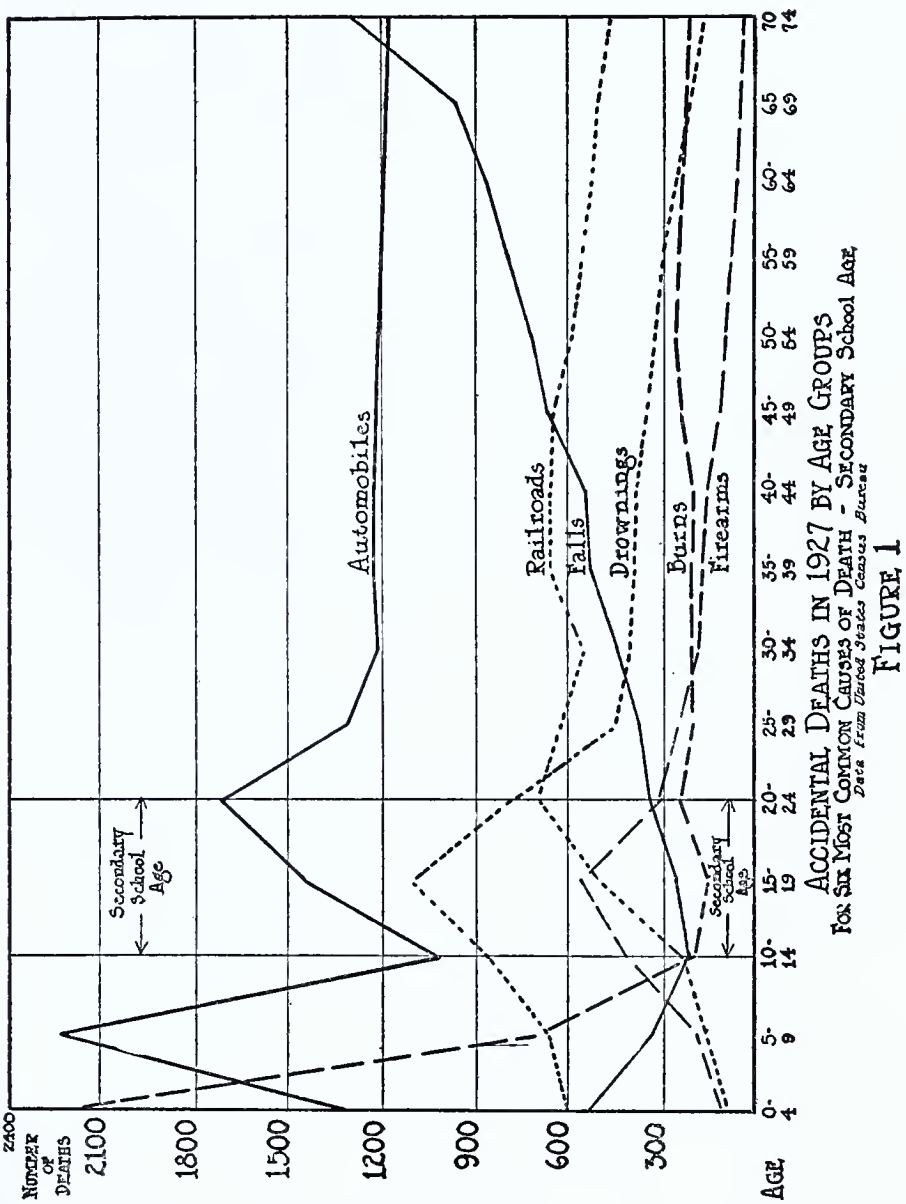
* Bureau of the Census Mortality Tables—Dept. of Commerce; Note change in age periods after age 35. Data in this table are from Registration States only; these included 89.8% of the estimated total population of continental United States in 1927.

† 18 (Street car accidents) includes collisions with automobiles.

‡ 19 (Automobiles) excludes collisions, listed in No. 16 and included in No. 18.

** 29 Does not include any form of suicide.

the importance of accident prevention education during this period. Automobile accidents, drowning, firearms, railroad accidents, falls, and burns are the six most common causes of fatalities during this



ACCIDENTAL DEATHS IN 1927 BY AGE GROUPS
FOR SIX MOST COMMON CAUSES OF DEATH - SECONDARY SCHOOL AGE
Data from United States Census Bureau

FIGURE 1

period of life. On the assumption that the time to stress education is when the most serious need arises, it appears that special efforts should be directed toward accident prevention during the junior and senior high school years.

RECENT TRENDS IN ACCIDENTS

During the last 12 years certain very definite changes in the importance of certain accidents have taken place. Table II shows the comparative importance of certain accidents in 1915 and in 1927 for the entire population and for the 10-19 age group. Automobile accidents are becoming more numerous each year. While the per cent of fatalities for all ages as a result of motor vehicle accidents was 7.8 of the total fatalities in 1915, in 1927 the per cent for this cause had increased to 28.8, with a corresponding increase during the same period for the 10-19 age group. On the other hand, with the exception of firearms accidents, which have shown a marked increase, there has been a considerable decline in the percentage of the seven other common causes of fatality. The most striking decline in importance is shown in the case of railroad accidents and drowning accidents. It can be readily seen that while the actual number of fatalities for each of these last causes may have increased during this period, the rapid increase in the motor vehicle accidents has forced a decline in the percentage of total accidents for each of the seven other causes mentioned above.

TABLE II

COMPARATIVE IMPORTANCE OF MOST COMMON CAUSES OF FATAL ACCIDENTS 1915 AND 1927*

Cause	Per cent of Total Deaths					
	For All Ages			Age 10-19		
	1915	1927	Increase or Decrease	1915	1927	Increase or Decrease
Automobiles	7.8	24.8	+17.0	10.6	27.5	+16.9
Falls	19.9	17.9	− 2.0	6.8	5.3	− 1.5
Drowning	11.4	8.6	− 2.8	26.9	21.9	− 5.0
Railroads	13.3	8.1	− 5.2	12.3	8.1	− 4.2
Burns	9.2	7.1	− 2.1	5.2	4.5	− 1.3
Firearms	2.9	3.2	− .3	10.2	15.9	− 5.7
Mines—quarries	4.4	3.4	− 1.0	2.9	2.0	− .9
Asphyxiation	4.0	3.0	− 1.0	1.8	1.2	− .6
Conflagration	2.0	1.8	− .2	1.9	1.2	− .7

* Data from the United States Mortality Statistics.

Since 1922 another interesting change is apparent. According to Table III, while 24.3 per cent of the accidental deaths at all ages were children under 15, in 1927 the per cent had decreased to 20.3. Whether or not accident prevention education has been partly responsible for this decrease cannot be definitely shown at the present time, but the fact that child accidents are not increasing as rapidly as accidents for the entire population is noteworthy.

TABLE III

DEATHS BY ACCIDENT IN THE UNITED STATES, 1922 TO 1926*

Year	Total Number of Deaths	Children Under 15	Per Cent of Accidental Deaths of Children of Total
1922	76,474	18,597	24.3
1923	84,547	19,025	22.5
1924	85,628	19,659	23.0
1925	90,351	19,462	21.5
1926	92,110	19,099	20.8

*Data from United States Census Bureau.

ACTIVITIES IN ACCIDENT PREVENTION

Industries were perhaps the first to attack the problem of accidents and organize prevention programs. Progressive industries all over the country have adopted constructive programs that are achieving definite results. The work of industries will be studied in a later chapter. Railroads and steamship lines have organized safety programs and year by year these forms of transportation are becoming safer. Many federal and state agencies have been actively interested in safety. The Bureau of Mines, the Departments of Labor and Commerce, state motor vehicle departments, local police and fire departments, insurance organizations, private safety organizations such as the National Safety Council and the National Fire Protection Association, and a large number of other organizations have been at work for a number of years in accident prevention. A countless number of laws have been placed upon the statutes, traffic regulations have been established, safety codes have been set up, dangerous machinery has been protected, and many other safety measures have been taken to reduce the hazards of modern life.

Education has a very important place in accident prevention. Machines may be perfected until there is rarely an accident due to lack of safeguards or defects in structure; elaborate codes and regulations may be established to prevent accidents; laws and restrictions may be passed—but with all of these education has a very definite contribution to make. It is through education that society may learn of the dangers of its environment and the methods by which accidents may be prevented.

The schools have been doing a considerable amount of work in safety education for many years. In fact, it is almost impossible to distinguish when safety education began. In the elementary schools, in particular, considerable stress has been placed on this subject for many years, sometimes treating safety as a special subject, and more often considering it as a "scheme of activities and materials to be diffused through the departments of the school curriculum."[5] Safety is so intimately tied up with health, citizenship, worthy home membership, vocation, and science, that it really becomes a point of view toward life in all of these activities, rather than a subject in itself.

WHAT IS SAFETY EDUCATION?

In a narrow sense safety education may be defined as the training of people to avoid accidents to themselves and to prevent accidents to others. But there is more to safety education than accident prevention alone. As shown by the analysis of the courses of study given in Table IV, it includes other important features. According to the National Safety Council,[6] "it means more than accident prevention—it means the conservation of all that goes to make life worth while—health, opportunity, and the material resources upon which life itself depends." Table IV shows what two cities, two states, and one research study include in their courses of study in safety education.

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[5] Rugg, Harold. *Introduction to Safety Education.* National Safety Council, 1925, p. 10.

[6] Education Division, National Safety Council. *Safety Teaching in a Modern School,* p. 4.

TABLE IV

CHECK LIST FOR SAFETY CONTENT IN COURSES OF STUDY

Subject	St. Louis 1927	Course of Study			Streitz 1927
		California 1928	Massachusetts 1928	Kansas City 1927	
Methods of first aid treatment	x	x	x	x	x
Causes and prevention of automobile accidents	x	x	x	x	x
What the community is doing to safeguard life, health and property	x	x	x	x	x
What the state and nation is doing for safety	x	x	x	x	x
Safety work of private organizations	x	x	x	x	x
Safety in the home and schools	x	x		x	x
Safety in the school shops	x				
The work of patrol and council	x		x	x	x
Fire prevention	x	x	x	x	x
Safety in health	x	x	x		x
Safeguarding natural resources	x	x	x		x
Safety in industry and transportation			x		x
Total	11	9	10	8	11

PREVIOUS STUDIES IN SAFETY EDUCATION

Henig in 1927 made a study of accidents in a vocational school and constructed a curriculum for accident prevention.[7] He gathered information on the causes of accidents over a three-year period, analyzed the accidents and organized curriculum materials in the light of this analysis and of the experiences of the Essex County Vocational School and other schools in the country. Henig found that during the three-year period with an average enrollment of 120 students there were 208 accidents, making a yearly average of approximately one accident for each two boys. He also found that the most intelligent boys, on a basis of the results of the Army Intelligence Test Alpha, had the lowest percentage of accidents while the least intelligent boys had the highest percentage of accidents. However, these last findings were based on a small number of cases and are not conclusive.[8] Neither are they substantiated by studies of industrial accidents.

[7] Henig, Max. *Safety Education in the Vocational School.* Doctor's Dissertation, New York University: Publications of the National Bureau of Casualty and Surety Underwriters, Vol. 3, 1928, 110 p.

[8] *Ibid.*, p. 97.

In 1925 Ruth Streitz[9] constructed a curriculum in safety education for the elementary schools. This curriculum was validated on the basis of an analysis of accidents in a specific school situated in the City of New York and an analysis of textbooks and courses of study in elementary school subjects.

Vaughn's[10] study "Positive versus Negative Instruction" while not a curriculum study made an interesting contribution to the question of methods of teaching safety. The problem of the controlling of behavior has been one of the most important that education has had to face. This is particularly true with regard to safety and health. If education is to function; if lives are to be safeguarded; if accidents are to be reduced, safety education must result in safe conduct on the part of the pupils. It is not sufficient to propose curriculum material designed to give safety information, but so far as it is possible, the instruction should be directed toward the acquiring of safety habits, skills, and attitudes.

Vaughn's study—an experimental study of the effects of various types of instruction on behavior—tends to show that:

"1. Verbal instructions unsupported by other forms of stimulation are relatively ineffective, especially with children.

2. The effects of warnings and threats are transient, especially with children.

3. Demonstrations of the manner in which injury may take place have more effect on behavior than mere positive or negative directions.

4. Actual experience of the ill effects of wrong reactions is most effective.

5. Drastic threats or punishment may occasionally inhibit desired behavior.

6. Detailed instruction in either positive or negative form tends to increase desirable responses and decrease undesirable responses.

7. Negative instruction shows a slight superiority over positive instruction in reducing undesirable responses."

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[9] Streitz, Ruth. *Safety Education in the Elementary School.* New York: Publication of the National Bureau of Casualty and Surety Underwriters, 1926, 143 p.

[10] Vaughn, James. *Positive versus Negative Instruction.* Doctor's Dissertation at University of Chicago: Publication of the National Bureau of Casualty and Surety Underwriters, Vol. II, 1928, 172 p.

Nietz[11] reported in 1926 a curriculum for teaching safety education. He analyzed courses of study and surveyed source materials and the experimental studies on the effects of positive and negative instruction. This was followed by a suggested program of safety education in the elementary schools.

The Twenty-Fifth Yearbook of the National Society for the Study of Education, *The Present Status of Safety Education,*[12] was devoted to a study of the organization and administration of safety education in the United States. In addition to the studies of Henig and Streitz, which have been discussed previously, Sidney J. Williams[13] presented an analysis of the problem of safety from the viewpoint of the safety engineer; Mary N. Arrowsmith[14] described the subject matter of safety education; and Idabelle Stevenson showed the prevalent methods of administering safety education in the schools.[15] A large part of the remainder of the Yearbook was given over to describing contents and methods of administration in the schools of Springfield, Massachusetts; Kansas City, Missouri; Lynn, Massachusetts, and Providence, Rhode Island. E. George Payne reported the methods of teaching safety in teacher training institutions. Among other results of his survey he found that very few of the 117 institutions investigated give special courses in safety education but nearly all of them emphasize safety in connection with courses in hygiene, physical education, civics, and other school subjects. Albert Whitney and A. B. Meredith[16] presented the basic theory on which safety education exists in the schools contending that "Safety is immediately related to life, physical and social. Because it is related to life, it has a place in the modern school curriculum. Safety is the condition which accompanies the realization of a purpose and teaching safety is teaching how to control the factors in an environment that a purpose may be realized."

In common with many of the more recent school subjects, safety education has suffered from a lack of carefully validated curriculum materials. A number of courses of study are available at the present

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[11] Nietz, John A. *Methods of Teaching Safety Education.* Unpublished Study. University of Chicago, 1926.

[12] The Twenty-Fifth Yearbook of the National Society for the Study of Education, 1926.

[13] *Ibid.*, pp. 1-23.

[14] *Ibid.*, pp. 25-54.

[15] *Ibid.*, pp. 55-67.

[16] *Ibid.*, pp. 327-54.

time but most of these are collections of safety materials, with but little emphasis on grade placement and validated content. Moreover, there is a distinct lack of carefully worked out experiments to show the relative values of different methods and materials. Otherwise there is a tendency to place in the course of study all kinds of safety materials.

After all, the real test in safety education is whether or not it brings results in reducing accidents, fires, and other losses. Industries believe in safety because they have been able to secure very definite results in the decrease of accidents. The railroad accident prevention program has resulted in a decrease in accidents of from 20 to 50 per cent. The real test of an educational program is therefore going to be measured by the general tendency over a period of years toward the reduction of accidents.

CHAPTER II

THE PROBLEM, AND THE METHODS THAT HAVE BEEN USED IN ORGANIZING CURRICULUM MATERIALS

The purpose of this study is to organize objectives and materials for teaching safety education in connection with the subjects of the secondary schools. Secondary education will be considered as beginning with the seventh grade and extending through the senior high school. In order to accomplish this purpose, the investigator has attempted to answer the following questions:

1. What are the hazards that are common to the modern industrial civilization?
2. What are the evidences of educational shortage that indicate a need of special instruction in the secondary schools?
3. What are the common safety activities by which organized society protects itself?
4. What are the safety activities found in secondary schools?
5. What are the safety materials that are found in secondary school textbooks?
6. What are the sources from which instructional materials in safety education may be drawn?

METHODS OF SECURING DATA

In order to secure data for this study the following methods have been used:

1. An analysis of secondary data giving the causes of accidents in the home, school, and public places.
2. An analysis of data showing the causes and prevention of fires.
3. A study of the common safety activities and methods of preventing accidents in industry and transportation.
4. An analysis of data showing the nature of common injuries.
5. A study of first aid books giving the method of treatment for common injuries.
6. A questionnaire study showing the safety activities in secondary schools.

7. An analysis of the safety materials in 38 secondary school textbooks.
8. A study, through the use of a safety test, of the educational shortage of a sampling of secondary school pupils in certain cities.

The material that has been prepared in curriculum form is not intended to be taught as a separate subject, but to be used by secondary school teachers for enriching the content in existing subjects. There is a demand on the part of educational authorities for materials to fit the needs of pupils. In this study an attempt has been made to base the curriculum on the common needs of society such as:

1. A knowledge of common hazards in the home, in public places, and in industry.
2. A knowledge of the methods of preventing fires and common accidents.
3. An appreciation of what is being done by various agencies to protect society.

METHODS THAT HAVE BEEN UTILIZED IN ORGANIZING CURRICULUM MATERIALS

Self-protection and the protection of property and social heritage have always been important objectives around which society has organized itself. The individual and the group have always attempted to devise means of protecting themselves against the hazards of life. During the past century the hazards of life have been constantly changing. Many diseases, for example, that were common fifty or one hundred years ago comparatively rare today. The death rate from infectious diseases has decreased steadily during the last decade.

The industrial age, however, has introduced many new dangers into our lives. The speeding up of life activities; the introduction of dangerous machinery; the rapid development of the automobile —all of these have resulted in new hazards to be overcome. Fatal accidents from motor vehicles during the past fifteen years have increased 1,050 per cent.[1] The national fire loss increased yearly up

[1] National Safety Council. *Accident Facts, 1928.*

to 1927. In spite of all that has been done by industry to protect workers, it is doubtful whether the death rate due to accidents has been decreased.

How will it be possible to meet these new hazards of life and provide education that will help to prevent the waste of human life and property? The investigator has approached the organization of curriculum materials from three directions.

1. *The record of accidents and preventable wastes—an indication of educational shortage.*

Many accidents are failures to realize fully and react properly to certain dangers in our environment. Many persons are electrocuted installing radio aerials over or under high voltage wires; others are badly burned starting fires with oils; still others are drowned as a result of not knowing what to do when a rowboat capsizes. These are evidences of errors or educational shortages. Franklin Bobbitt[2] suggested this method when he maintained that "The curriculum of the schools will aim at those objectives that are not sufficiently attained as a result of the general undirected experience. Each mistake is a call for directed training. The curriculum of the directed training is to be discovered in the shortcomings of individuals after they have had all that can be given by the undirecting training." W. W. Charters[3] and a number of others used this method in their analysis of errors made by pupils.

Meeting the educational shortages shown by the records of accidents, becomes a basic responsibility of the school. So far as possible the investigator has attempted to determine these forms of educational shortage in the secondary school age-period. In many cases it has not been possible to segregate the accidents of this age-period. However, Table I shows that certain kinds of accidents common to all ages are also common to this particular period of life and a study of the causes of accidents in general probably gives a good picture of those of the secondary school age period.

The investigator has therefore attempted to determine the causes of various kinds of common accidents. In order to do this

[2] Bobbitt, Franklin. *The Curriculum.* Houghton Mifflin Co., 1918, p. 44.

[3] Charters, W. W. and Miller, Edith. *A Course of Study in Grammar Based Upon Grammatical Errors of School Children in Kansas City, Missouri.* Bulletin of the University of Missouri, No. 9.

it has been necessary to use a considerable amount of secondary data. These data which have been gathered by such agencies as the United States Census Bureau, the National Board of Fire Underwriters, the National Safety Council, the public schools of various cities, the United States Bureau of Labor Statistics and other national organizations, the State Departments of Health and Motor Vehicles, the National Bureau of Casualty and Surety Underwriters, and a number of other agencies, present a comprehensive survey of accidents in the United States. Carefully gathered from reliable sources they represent a far more valuable collection of statistics than could have been secured by working with a necessarily narrow sampling of primary data. An attempt has therefore been made to utilize as far as possible all authentic data that were related to the problem at hand—the determination of causes of accidents and other losses, and the common safety activities by which organized society protects itself.

2. *The Common Safety Activities By Which Individuals and Society Protect Themselves.*

This is the second method that was used to approach the problem of curriculum building. This method has been used by a number of investigators in various fields, including Jones,[4] Charters,[5] Anderson,[6] Bobbitt,[7] and many others. Snedden[8] suggests that "certain health values now highly approved by local communities, national administrative authorities or individuals, with regard to disease prevention, disease cure, ... can be made the basis of evaluating school procedures."

In order to determine these common life activities by which an individual or society protects itself, a study has been made of activities such as the following:

1. What fire prevention activities are used by communities in reducing fires?

[4] Jones, Lloyd L. *Job Analysis in Bookkeeping*, University of Iowa Monographs.

[5] Charters, W. W. and Whitley, I. B. *Analysis of Secretarial Duties and Traits*, Williams and Wilkins Company, 1924.

[6] Anderson, John A. *Fitting the Commerce Course of the High School and Junior College to the Needs of the Community.* Pasadena, California, 1926.

[7] *Op. cit.* Bobbitt, "The Social Factors of Physical Efficiency," *The Curriculum*, pp. 189-204.

[8] Snedden, David. *Foundations of Curricula.* Bureau of Publications Teachers College, Columbia University, 1927, p. 22.

2. What safety activities are organized by industries to reduce accidents?
3. What safety activities are utilized in land and water transportation to reduce accidents?
4. What safety activities of the individual will tend to reduce drowning accidents?
5. What activities are performed by school safety patrols and councils?
6. What safety activities on the part of individuals will tend to reduce automobile accidents?

These common activities have been determined by an analysis of statistical data and are utilized in the organization of the materials and activities column of the proposed curriculum.

3. *The Common Safety Materials Found in Textbooks and Courses of Study.*

This third method of approach involves an analysis of courses of study and textbooks. It has been used by Streitz,[9] Strang,[10] Meier,[11] Rugg,[12] Webb,[13] and many others.

This method is of comparatively little value in validating curriculum materials in safety education for the secondary schools. In the first place, there are very few safety items found in courses of study in high school subjects. Furthermore, although the inclusion of items in secondary school textbooks indicates the opinion of the textbook writers concerning the importance of the items, there is a tendency for textbook materials to lag behind the actual needs and problems of the environment. This is brought out in the analysis of 38 secondary school textbooks reported later in this study. As a result this method was used to indicate the lack of adequate materials in textbooks rather than to validate such materials.

In order to utilize these methods of securing curriculum materials in the following chapters the parallel column form has been

[9] Streitz, Ruth. *Safety Education in the Elementary Schools.*

[10] Strang, Ruth. *Subject Matter in Health Education.*

[11] Meier, Lois. *Health Materials in Science Textbooks.*

[12] Rugg, Earle. *Curriculum Studies in the Social Studies and Citizenship.* Teachers College, Columbia University, 1923.

[13] Webb, Hanor A. *General Science Instruction in the Grades.* George Peabody College for Teachers, 1921, pp. 9-15.

used for the sake of clarity and convenience. The objectives are organized from the analysis of the data and the materials and activities are suggested from the study of the causes of accidents. Selected references are included for each subject but there is no attempt to make the curriculum materials or references comprehensive. It is felt that curriculum workers may have special safety problems and safety activities peculiar to their local communities and that the method offered in this study may suggest a technique of studying the local needs. There has been but little attempt to show methods in teaching these materials and to show the possible outcome of such instruction. It would require a far more comprehensive study than this to validate procedure and methods of teaching safety. These should be subjects for further study.

CHAPTER III

THE CAUSES AND PREVENTION OF PUBLIC ACCIDENTS

Since 1911 there has been a very marked increase in fatalities as a result of public accidents. This is largely due to an increase of 1,050 per cent in motor vehicle fatalities. While railroad fatalities since 1911 have decreased 37 per cent and deaths from street car accidents have decreased 44 per cent, motor vehicle fatalities have increased so rapidly that at the present time they total over 25 per cent of the accidental deaths in the United States.[1]

According to the United States Census Bureau reports[2] the estimated total number of accidental deaths in the United States in 1927 was 93,078. Of this number approximately 25,778 or 27 per cent of the total were caused by motor vehicles; 9,134 or 10 per cent by railroad and street cars; 1,491 or 1.6 per cent by other public vehicles; 8,051 or 9 per cent by drowning; 2,939 or 3 per cent by fire arms. It is evident, according to the classification used by the National Safety Council in Table V that fatal public accidents would include over 50 per cent of the total number of accidental deaths. It is fairly safe to assume that approximately one half of the accidental deaths are caused by public accidents, one-fourth by industrial accidents, and one-fourth by home accidents.

Table V shows the distribution of accidental deaths in public accidents from reports of cities and states to the National Safety Council. This distribution does not show the total number of fatalities in the United States but gives an adequate sampling that suggests the importance of certain types of accident at the various age levels.

In this chapter the investigator has made a study of the causes and prevention of the most common public acidents. He has analyzed both primary and secondary data, suggested objectives for the prevention of accidents, and organized curriculum materials and activities in the light of accident experiences. The kinds of accidents that have been studied are as follows:

1. The causes and prevention of motor vehicle accidents.
2. The causes and prevention of accidents in and about schools.
3. The causes and prevention of drowning accidents.

[1] National Safety Council. *Accident Facts, 1928*, pp. 7-9.

[2] *Op. cit.*, See Table I.

TABLE V

FATAL PUBLIC ACCIDENTS BY AGE IN 1927*

Types of Accident	Age					
	0-4	5-14	15-54	55 and Over	Uncl.	Total
MOTOR VEHICLE—TOTAL (Average population 45,000,000)†	382	1339	2964	1729	2995	9409
Motor vehicle with pedestrian	326	1139	1320	1439	243	4467
Motor vehicle with motor vehicle	23	60	600	126	70	879
Non-collision-operating accident	16	36	347	45	55	499
Motor vehicle with fixed object	3	18	266	21	44	352
Motor vehicle with railroad train	7	13	166	38	67	291
Motor vehicle with street car	2	9	117	26	13	167
Motor vehicle with bicycle	0	45	39	8	4	96
Motor vehicle with other vehicle	1	4	50	3	3	61
Motor vehicle with horse vehicle	0	2	25	8	2	37
Unclassified	4	8	2	8	2493	2536
OTHER PUBLIC VEHICLE—TOTAL (Average population, 18,000,000)	16	48	289	149	365	867
Railroad—not with motor vehicle	3	22	170	63	269	527
Street car—not with motor vehicle	10	18	97	75	51	251
Other vehicle—not with motor vehicle	3	8	22	11	45	89
NON-VEHICULAR—TOTAL (Average population, 10,000,000)	34	148	430	111	582	1305
Other street accidents	1	9	35	25	15	85
Buildings and structures	8	4	53	12	45	122
Drowning	22	78	165	20	272	557
Fire arms	0	16	40	3	104	163
Other public accidents	3	41	128	49	32	253
Unclassified	0	0	9	2	114	125

* As reported to National Safety Council by cities and states.

† Average population indicates the average population of cities and states reporting accidents.

THE CAUSES AND PREVENTION OF MOTOR VEHICLE ACCIDENTS

In recent years many interesting studies have been made of the causes of motor vehicle accidents. The Department of Motor Vehicles of Connecticut has been conducting studies[3] in this field for several years. These have included studies of the mental conditions of operators, the effects of weather upon accidents, the

[3] *Yearly Bulletins of the Department of Motor Vehicles.* State of Connecticut, 1924 to 1928.

causes of automobile accidents, and other important subjects. Among other findings the Commissioner of Motor Vehicles reported that there were in 1926 a total of 24,326 accidents, in which 9,802 persons were injured, 332 were killed, and a property damage of $2,391,346 was caused.[4] On a basis of the 274,782 registrations this tended to show that approximately 1 motor vehicle out of 11 registered was in an accident yearly. In 1927 the number of accidents had increased to 26,832 with a property damage of $2,763,341 out of a registration of 300,000 cars, giving a ratio of 1 accident to 11 registered motor vehicles.

Although this sampling of 300,000 motor vehicles is altogether too small to draw conclusions as to the probable number of automobile accidents yearly in the United States, it nevertheless gives some idea of the importance of such accidents from a standpoint of personal injuries, fatalities and property losses. In this connection the National Safety Council estimated that in 1927, when there were 23,125,000 motor vehicles registered in the United States, that there were 25,800 fatalities and that over 900,000 persons were injured by motor vehicles.[5] The Statistics Committee of the Council used in this connection a ratio of 35 to 1 for non-fatal accidents to fatalities as a result of experiences of states and cities reporting accidents. Previous to this, the National Conference on Street and Highway Safety estimated that in 1923 the annual cost of highway accidents was $600,000,000. It would be expected, as a result of the increase in the number of accidents, that the cost of accidents for 1927 and 1928 would be considerably higher.

The problem of reducing automobile accidents is one of national concern. Traffic engineers are learning that accidents do not "just happen." They have very definite causes which in many cases may be located and remedied. Fortunately the experiences of various cities and states have been tabulated and analyzed by the Statistics Committee of the National Safety Council.[6] These accidents will be studied in three ways—action of the driver, action of the pedestrian, and failure on the part of the equipment. It has been found that 65 per cent of the accidents are of motor vehicle-pedestrian type; 13 per cent are due to collisions of motor vehicles.

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[4] *Op. cit.*, Bulletin No. 40.

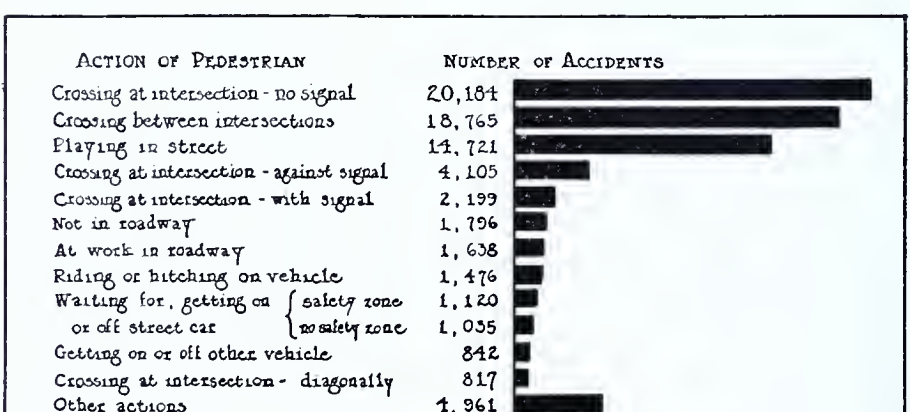
[5] *Accident Facts, 1928.*

[6] *Ibid.*, pp. 21-29.

The remaining 22 per cent include non-collision accidents and collisions with fixed objects, railroad trains, and street cars.

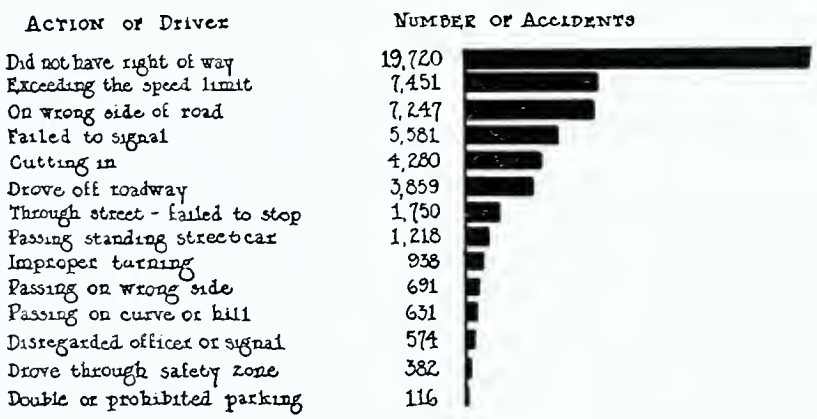
These statistics have been collected during 1927 from reports of cities and states by the National Safety Council and cover 121,314 cases in which information was available. Figure 2 shows, in the analysis of 73,659 accidents, what the action of the pedestrian was at the time of the occurrence of the accident. It will be noted that "crossing at intersections not protected by signals", "crossing between intersections", and "playing in the street" were factors in by far the largest number of accidents. Riding bicycles and roller skating on busy streets contributes to many accidents. Safety patrols will do well to strike directly at these causes of accidents and organize their program by attempting to prevent wrong action on the part of pupils.

Figure 3 shows an analysis of 54,438 cases where the driver was at fault. Ignorance of traffic rules and regulations and lack of experience in driving may be important causes of accidents, but by far the largest number of accidents are due to carelessness, taking chances, or a wrong attitude toward safety. "Not having the right of way" and "speeding" are the most frequent causes of accidents in this study. Over 80 per cent of the accidents take place when the motor vehicle is "going straight through", while only a small per cent of the accidents take place when turning, skidding, or backing.


Action of Pedestrian
Number of Accidents
Crossing at intersection - no signal 20,184
Crossing between intersections 18,765
Playing in street 14,721
Crossing at intersection - against signal 4,105
Crossing at intersection - with signal 2,199
Not in roadway 1,796
At work in roadway 1,638
Riding or hitching on vehicle 1,476
Waiting for, getting on or off street car { safety zone 1,120 / no safety zone 1,035
Getting on or off other vehicle 842
Crossing at intersection - diagonally 817
Other actions 1,961

Action of Pedestrian at Time of Accident Occurrence

Figure 2


ACTION OF DRIVER
NUMBER OF ACCIDENTS
Did not have right of way 19,720
Exceeding the speed limit 7,451
On wrong side of road 7,247
Failed to signal 5,581
Cutting in 4,280
Drove off roadway 3,859
Through street - failed to stop 1,750
Passing standing streetcar 1,218
Improper turning 938
Passing on wrong side 691
Passing on curve or hill 631
Disregarded officer or signal 574
Drove through safety zone 382
Double or prohibited parking 116

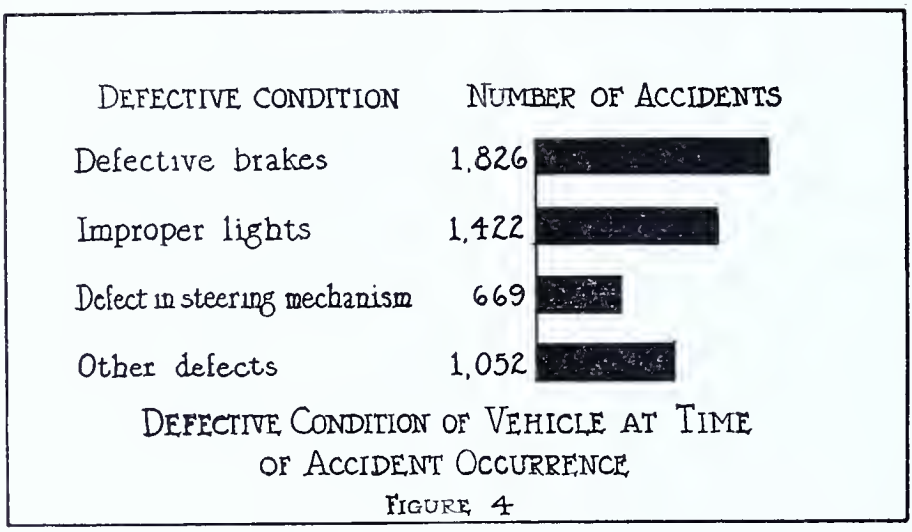
ACTION OF DRIVER AT TIME OF ACCIDENT OCCURRENCE

FIGURE 3

All over the country there has been considerable agitation toward the setting up of uniform traffic codes. Many cities have already adopted the *Model Municipal Traffic Ordinance* as prepared by the National Conference on Street and Highway Safety. There seems to be little doubt as to the value of uniformity in municipal traffic regulations. Several states have conducted "Motor Vehicle Inspection Campaigns" for the purpose of locating and correcting defects in automobiles registered in the state. Undoubtedly there are a large number of automobiles on our highways at the present time that are a menace to safety. However, in the 1927 report of motor vehicle fatalities, as shown by the National Safety Council, only 4,969 cases of accidents—a small percentage of all accidents for which other information was reported—were due to defective equipment. Figure 4 shows the causes of accident where defective equipment was at fault.

This figure indicates that comparatively a small percentage of accidents are due to defective equipment. This is borne out by the analysis of the distribution of blame among factors involved in accidents as reported by the National Conference on Street and Highway Safety.[7] It is evident from Table VI and Figure 4 that

[7] National Conference on Street and Highway Safety, *Report of Committee on Causes of Accidents*, Washington, 1926, 24 p.



DEFECTIVE CONDITION OF VEHICLE AT TIME OF ACCIDENT OCCURRENCE

FIGURE 4

only a relatively small number of accidents are caused by the weather conditions, the highway, and defects or failure on the part of the motor vehicle. Yet these factors are not to be neglected. Improvements in the safety devices of motor vehicles during the past few years through the development of four-wheel brakes, windshield wipers, better lighting, more reliable tires, and similar improvements have had a certain value. Stricter enforcement of traffic rules and better traffic control have been useful in preventing accidents.

TABLE VI

DISTRIBUTION OF BLAME AMONG FACTORS INVOLVED IN ACCIDENTS*

Factor Causing Accidents	Per Cent of Total Cases in Which Factor is Blamed					
	All Accidents		Fatal Accidents			Average
	Conn. 1924	Mont., Ore., Wash., 1924	Mass. 1924	Nat'l Auto Chamber of Comm. Jan. 1924 May 1925	St. Louis 1924	Five Sources
Operator	77.7	63.5	62.0	40.4	59.2	60.6
Non-operator	15.4	11.9	26.3	46.7	36.7	27.4
Total human factor	93.1	75.4	88.3	87.1	95.9	88.0
Vehicle	5.6	11.3	11.2	5.8	3.1	7.4
Highway	1.3	13.3	.5	7.1	1.0	4.6
Physical conditions	6.9	24.6	11.7	12.9	4.1	12.0

* From the records of the National Conference on Street and Highway Safety, 1926.

It is important to bear in mind that approximately 88 per cent of motor vehicle accidents are due to the human factor. Here is the place where education may play its part. Many accidents are caused by ignorance of traffic rules and lack of knowledge about motor vehicles. Others are caused by carelessness, bad mental habits, and lack of consideration for others. A large share of the pedestrian accidents are due to taking chances and bad habits of playing in the streets. Connecticut[8] found that inattention, on the part of both operator and pedestrian, was by far the largest single cause of accidents. In addition Kirby reported in the 1928 study of motor vehicle accidents in Connecticut that drivers under twenty years of age were three times as liable to accidents as those over fifty.

Railroad-highway grade crossing accidents have been increasing in recent years in spite of all that has been done to eliminate or protect dangerous crossings and educate the people. The Interstate Commerce Commission,[9] however, reported a slight decrease in the fatalities at crossings (from 2,491 in 1926 to 2,371 in 1927) with a corresponding decrease in the number of persons injured (from 6,991 to 6,613). Street railway companies and bus companies have found it advisable to require their passenger vehicles to come to a full stop before passing over railroad crossings. There seems to be question as to whether this is advisable for motor vehicles in general. However, extreme caution is necessary to avoid accidents at unprotected grade crossings.

Little has been shown relative to the errors that people make which cause the state to suspend or revoke their licenses to operate motor vehicles. It is important to locate some of these errors because many are indications of educational shortage while others show bad practice on the part of the operators. An analysis of the records of the Commissioner of Motor Vehicles for New York in 1926 showed a total of 20,160 revocations or suspensions of operators' licenses.[10]

Table VII has been constructed to show some of the causes for this action by the State.

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[8] *Op. cit.*, Bulletin No. 40.

[9] *Report of Interstate Commerce Commission*, Washington, 1928.

[10] Harnett, Charles A. *Revocations and Suspensions of Licenses.* Albany: Department of Motor Vehicles, 1926.

TABLE VII

CAUSES OF SUSPENSION OR REVOCATION OF MOTOR VEHICLE LICENSES
NEW YORK STATE, 1926

Causes of Conviction or Charge	Revocations or Suspensions	
	Number	Per Cent of Total
Operating motor vehicles while intoxicated	2,868	14
Reckless driving or speeding	4,316	21
Leaving the scene after an accident	634	3
Failure to file bond for taxi	4,713	23
False statements on application	337	2
Charged with homicide or assault	1,200	6
Permitting unlicensed operator to drive	555	3
Accident resulting in serious injury to a person	1,543	8
All other violations	3,994	20
Total	20,160	100

This table goes to show the seriousness of the legal side of the motor vehicle problem and points out some of the most important errors that people are making which require action on the part of the state.

From the foregoing statistics it is evident that the motor vehicle is one of the most important hazards that exists today. With over 23,000,000 motor vehicles on the streets, the problem of accident prevention touches the lives of everyone. Pupils in secondary schools in increasing numbers are learning to drive cars and many others will become operators soon after they leave school. In many states no licenses are required at the present time and in other states the requirements for licenses are comparatively simple. On the basis of Briggs' statement of one of the purposes of the junior high school "To teach pupils to do better the worth while activities they are sure to do anyhow," there are some things that can be done in the secondary schools. It is not to be expected that the school can undertake to teach pupils to drive motor vehicles. This must be left to other agencies. The schools can do something in laying a foundation in civics, science, and other school subjects by giving information relating to traffic rules and regulations, the causes of accidents, the best methods of driving, the care of motor vehicles, and similar related subjects.

From an analysis of the preceding tables and figures the following are suggested as objectives and materials for teaching the causes and prevention of motor vehicle accidents.

THE CAUSES AND PREVENTION OF MOTOR VEHICLE ACCIDENTS

General Science, Auto Mechanics, Physics

Objectives	*Activities and Materials*
To know some of the common causes of motor vehicle accidents due to the action of the operator.	The most common causes of accidents. Not having the right of way. Exceeding the speed limit. On wrong side of the road. Failed to signal. Cutting in. Driving off roadway. Failed to stop at through street. Passing a standing street car. Improper turning or backing. (See Figure 3)
To know the traffic regulations of the community and to know something about the uniform vehicle code.	Regulations in regard to parking. Regulations in regard to passing street cars. Speed regulations. One way streets. What to do on approach of police or fire department vehicles. How to make turns. Reporting accidents. (For information on Uniform Vehicle Code see report of National Conference on Street and Highway Safety, 1926) The importance of reporting accidents.
To know what is necessary to secure a license to operate motor vehicles.	This depends upon the state in which the car is registered. Age requirements. Physical requirements. The passing of required tests. Lack of tests or requirements in certain states.
To know the most common physical defects of motor vehicles that may cause accidents.	The dangers of defective brakes. Improper light on motor vehicles. Defects in steering mechanism. Defective, worn out tires. Defective vision (lack of rear-view mirror or windshield cleaners). Other defects. (See Figure 4)

Objectives	*Activities and Materials*
To know the hazards of grade crossings and the safest method of using such crossings.	2,371 persons were killed and 6,613 injured in grade crossing accidents in 1927. The danger of unprotected crossings. The importance of slowing down at crossings. The methods by which bus companies and street railways are attempting to prevent grade crossing accidents. How dangerous crossings are protected.
To know the neeessity for caution in operating motor vehicles in iey, rainy, or foggy weather.	The value of chains. The importance of driving slowly in bad weather. How to reduce skidding.
To know the dangers of riding in motor vehicles when the operator is under the influence of liquor.	In 1926, 2,868 drivers of motor vehicles in New York State were charged or convicted of operating motor vehicles while intoxicated. Why intoxicated drivers are unsafe. The effect of alcohol on physical and mental control.
To know the most common occurrence of aceidents where pedestrians were involved.	Crossing at intersections when there is no signal. (1/3 of the accidents) Crossing between intersections. (1/4 of the pedestrian accidents) Playing or riding bicycles in the street. (1/5 of the accidents)
To exercise eare in crossing streets under all conditions.	Crossing at intersections carelessly either with or against the signal. Riding or hitching on vehicles. Getting on or off another vehicle. Crossing at intersections diagonally.
To know of the importanee of waiting for favorable signals for crossing the street.	Twice as many accidents at protected crossings take place when the crossing is made against the signal than with the signals. (Danger of jay walking)
To know what the eommunity and state are trying to do to reduce automobile aeeidents.	The work of the Junior Safety Patrol. The work of the police traffic dept. The use of traffic signals. The enforcement of traffic laws. Keeping records of accidents. Motorcycle and automobile officers. Direction of traffic near schools.

Objectives	*Activities and Materials*
To know what the community and state are trying to do to reduce automobile accidents. (*Continued.*)	The work of the state departments of motor vehicles. Safety work of automobile clubs. State and local campaigns for safe driving. The work of the National Safety Council. (See appendix) *Reference* *Traffic work of Police Departments.* Chicago: National Safety Council, 1928. *Reports of State Motor Vehicle Departments.* *Reports of National Conferences on Street and Highway Safety,* Department of Commerce, Washington. *Accident Facts, 1928 and 1929,* National Safety Council. *Public Safety,* Published monthly by the National Safety Council. *Uniform Vehicle Code,* National Conference on Street and Highway Safety, Washington, D. C. *"Save-a-Life" Motor Vehicle Equipment Inspection Campaign Reports.* Department of Motor Vehicles in New Jersey, Pennsylvania, Massachusetts, Delaware, Maryland and New York.

THE CAUSES AND PREVENTION OF ACCIDENTS IN AND ABOUT SCHOOLS

Comparatively little data are available relative to the extent of fatal and non-fatal school and playground accidents. In the future, through the reporting system advocated by the statistical department of the National Safety Council,[11] it will be possible to secure objective evidence regarding such accidents. However, several studies have been made of school and home accidents, which, although they do not provide a wide sampling, at least indicate the predominating causes of accidents. The first of these was made in St. Louis in 1926 where school authorities kept records of school accidents for a period of one year.[12]

[11] Statistics Committee, National Safety Council, *Accident Facts, 1928,* pp. 43-45.

[12] Cocking, Walter D. et al. *St. Louis Public School Messenger.* Safety Teaching, St. Louis, Department of Instruction, 1927, 126 p.

TABLE VIII

CAUSES OF ACCIDENTS IN ST. LOUIS HIGH SCHOOLS, 1925-1926*

Cause	No. of Pupils
Falls	44
Turned ankle, knee or back while going upstairs or playing ball	15
Tool, lathe or apparatus	9
Collision (not fall)	45
Struck by falling, flying or exploding object	19
Diving	3
Burns (in laboratory or shops)	6
Improper landing, high jumping	5
Gas	1
Fainting	1
Miscellaneous	3
Total accidents	151
Total High School enrollment	11,305
Percentage of accidents based on enrollment	1.3

* From the Public School Messenger, St. Louis Public Schools, 1927.

It is interesting to note here that approximately one-third of the high school accidents took place in the gymnasium, one-sixth in shops and laboratories and one-sixth on the campus and athletic fields. It was also found that the percentage of accidents to enrollment in the high schools was 1.3 as compared with .6 in the elementary schools.

Los Angeles, 1927-1928, kept a record of the major accidents in the elementary and secondary schools. During this year 1208 accidents occurred in or about the public schools or athletic fields. This data was compiled in Los Angeles and Table IX has been constructed to show the frequencies of different types of accidents.

A study of this table shows that:

1. The great majority of school accidents (approximately 65 per cent) take place on the school grounds and athletic fields.
2. In comparison with the school enrollment there are more accidents in the high schools than in elementary schools.
3. Major non-fatal accidents (those which cost a loss of school time of at least one day) exist in a ratio of 242 to 1 to fatal school accidents. This is a much higher ratio than apparently exists in the (insurance company) records of policy holders.

4. Of the athletic sports, although baseball has had the largest number of accidents, football and jumping have been found to be more dangerous from a standpoint of percentage of accidents of those competing.

TABLE IX

Los Angeles City School District

Compilation of Data on Major School Accidents

Type of Accident	Elementary School	Junior High School	Senior High School	Total
1. School Grounds	502	109	152	763
Apparatus	172	4	6	182
Games	200	74	125	399
Baseball	162	41	29	232
Basketball	2	8	4	14
Football	6	9	66	81
Jumping	19	9	21	49
Soccer	6	3	4	13
Volley Ball	3	1	0	4
All other games	2	4	0	6
Miscellaneous	130	31	21	182
2. Building and Agricultural	106	62	113	281
3. Outside School Grounds	121	18	25	164
Traffic	98	14	22	134
Miscellaneous	23	4	3	30
Total Accidents	739	189	290	1,212
Total fatalities	4	0	1	5
Broken members	354	89	135	578
Total School registration	130,355	32,237	40,031	202,623
Ratio of accidents to pupil enrollment	1–178	1–170	1–139	1–167

One of the most interesting studies of fatal and non-fatal accidents has recently been made by M. B. Elson of Gilbert, Minnesota.[13] In this study, records were kept for a period of six months of all types of pupil accidents showing the time lost and the number of fatalities. Table X indicates the relative importance of different types of accidents.

[13]Elson, M. B. *The Value of School Accident Reports.* Safety Education, January, 1929.

TABLE X

General Summary of Accidents Reported by Co-operating Schools in N. E. Minnesota from January, 1928 to September, 1928

Month	Pupils	Public Acc.		Home Acc.		School Acc.		Total		
		No.	Days Lost	No.	Days Lost	No.	Days Lost	No.	Days Lost	Fatalities
Jan.....	44,294	69	214	73	241	67	156	209	612	0
Feb.....	58,438	130	292½	115	272¼	130	269	375	833¾	1
Mar.....	57,078	58	83	105	181¾	99	133	262	397¾	1
Apr.....	51,450	45	103	76	157¾	69	84½	190	345¼	2
May.....	50,911	42	89	91	239	55	94¼	188	422½	2
Sept.....	51,170	41	97½	88	128½	109	82¼	238	308¼	0
Total....	313,341	385	879	548	1220½	529	819	1462	2919½	6

From this table it has been found that 548 accidents or 37 per cent of the total of 1462, take place in the home; 529 or 36 per cent occur in or about the school; and 385 or 27 per cent occur in other public places. On the basis of 529 school accidents for the six months period and an average monthly attendance of 52,223, it is probable that the total number of school accidents for the school year might exceed 790.

It is impossible to draw any reliable conclusions from these three distributions of school and playground accidents that would be conclusive. In the first place the sampling includes only a small percentage of the total secondary school enrollment in the country. Furthermore, there is apparently a wide difference in the understanding of what would be reported as a major accident in these three studies. St. Louis showed a percentage of 1.3 for accidents in the high schools based on enrollment; in Los Angeles the per cent was 0.72 on a basis of registrations, and in the study in northeast Minnesota the per cent of pupil accidents in all public schools reporting was 1.5.

School accidents, although not as serious as accidents in other public places and in the home, do exist and should present a problem to school administrators. It is important that such accidents be reduced to a minimum. From an analysis of the statistics on school accidents the following objectives, materials and activities are suggested for principals and other responsible school officials.

SUGGESTED PROGRAM FOR THE PREVENTION OF SCHOOL ACCIDENTS

For Principals, Physical Directors and Teachers

Objectives	*Activities and Materials*
To carry on a study to locate the kinds of accidents that take place in and around the school.	Method of making studies in St. Louis, Los Angeles and Gilbert, Minnesota. School accident report blanks of National Safety Council. Making a study of school accidents for six months or a year period.
To see that some kind of traffic control is afforded in playgrounds and in buildings.	Appointment of traffic officers by student council or safety advisor. Control of traffic at congested points in the building. Prevention of accidents on playgrounds by leaders or patrols.
To see that pupils are protected against traffic dangers outside the school building.	Organize safety councils for supervision of all safety activities. Organize safety patrols for duty at dangerous points near the school building. Have patrols under the direction of a safety advisor (teacher). Training of patrols by police department. Shutting off streets (when possible) during recess.
To see that there is proper supervision of gymnasium and swimming pool activities.	Elimination of unsafe gymnasium apparatus. Inspection of apparatus. Padding of dangerous pillars, or supports in the gymnasium. Care in the use of mats in apparatus work. Training of leaders corps for protection of apparatus activities. Careful supervision of swimming pool at all times. Elimination of diving board when pool is not sufficiently deep. Requiring hot showers before entering pools. Keep pool clean and sanitary.
To see that as far as possible fire hazards and accident hazards are eliminated from school buildings.	Some examples of fire hazards. Doors of building opening inward. Paper and debris in boiler room. Defective furnaces. Organizing and perfecting fire drills.

Objectives	*Activities and Materials*
To see that as far as possible fire hazards and accident hazards are eliminated from school buildings. (*Continued.*)	Removal of snow and ice from walks and steps. Protection of slippery ramps or stairways. Lighting dark corridors.
To see that proper supervision is given to prevent accidents in industrial and domestic art activities.	Demonstrating how to use new machinery. Safeguards for dangerous machines. Careful instruction in regard to the use of hand tools. Instruction in the use of stoves, laundry apparatus, and other domestic arts apparatus. (See Henig, *Safety Education in the Vocational School*)
To see that every precaution is taken to prevent laboratory accidents.	Preliminary instructions. How to cut and bend glass. The dangers of concentrated acids and alkali. Precautions in doing certain experiments. The use of the safety hood. Dangerous chemicals that are used in the laboratory.
The prevention of athletic injuries.	Proper protection of players. (Headgear, shoulder pads, etc.) Proper training and conditioning of teams. (The accident rate during the early part of the season is often high due to the condition of players). Either the coach should be trained in first aid or someone should be available to take care of injured players. The comparative dangers of different types of athletics. Preventing accidents due to poor playing surfaces—jumping pits, etc.
To see that first aid materials are available in school buildings.	School and gymnasium first aid kits. (American Red Cross) Designate a responsible person for taking care of first aid needs.

References

The Junior Safety Council Handbook, National Safety Council.
An Introduction to Safety Education, National Safety Council.
Henig, *Safety Education in the Vocational Schools.*

THE CAUSES AND PREVENTION OF DROWNING ACCIDENTS

During recent years drowning has ranked next to motor vehicles as a cause of accidental death for persons in the 10-19 age group. The Bureau of Census reports indicate that in 1926 the number of fatalities due to drowning was 7,418. Estimates for 1927 indicate that the number exceeded 8,000. Since 1911, however, the fatalities, in spite of a marked increase in the number of swimming pools, bathing places and summer camps, has remained almost constant. Drowning accidents are particularly important at the high school age because it has been found that over 30 per cent of all fatalities due to this cause are persons in the 10-19 age group.

The efforts of the American Red Cross in setting up standards for the supervision of public and private bathing places have been very influential in reducing drowning accidents. Waterfront standards for camps have been established, life-guard provisions for swimming pools and bathing beaches have been set up, and many persons trained in life saving and water safety. The report of the Life Saving Service[14] on January 31, 1926, indicated that 26,248 men, 18,985 women, and 48,416 juniors had completed the requirements for the Junior and Senior Red Cross Life Saving certificate. In addition, many hundred thousand persons had been taught to swim under the supervision of instructors trained by the Red Cross. The Boy Scouts, Girl Scouts, Young Men's Christian Association, and similar organizations have been using many of the methods advocated by this organization.

Table XXXI shows that many of our secondary schools have been active in teaching swimming and life saving. Nevertheless, the great majority of our school population probably learn what they know about swimming outside of school. Learning to swim and learning something about water safety is naturally the first step in the program of making individuals reasonably safe in the water. However, it is important that an attempt be made to find out the real causes of accidents to swimmers and non-swimmers, so that adequate instruction may be given to prevent such accidents.

It has been impossible to locate reliable statistics that would

[14] American Red Cross. *Life Saving Service.* Washington, D. C., 1926, p. 3.

indicate the relative frequency of different causes of drowning accidents. The mortality records show that a large majority of the fatalities take place during the summer months and that approximately 90 per cent are men and boys. A surprising fact is that the largest number of drowning fatalities, for any single year of life, takes place between the ages of one and two. This shows very clearly the importance of protecting infants from the many hazards—such as tubs, cisterns, wells, and brooks—that may exist about the home.

The method that has been used to determine the importance of various causes of drowning is as follows: A questionnaire, made out with the assistance of Red Cross officials, has been submitted to twelve experienced life-guards and experts on life saving in various sections of the country. These experts include members of the staff of the American Red Cross under Commodore W. E. Longfellow and several directors of municipal life-guards. They were asked to rank the causes of drowning in order of their relative frequency in the area in which they were located. It would not be expected that there would be close agreement between the rankings of these individuals. Experiences in sea-coast cities have indicated that many of the drowning accidents are associated with accidents in connection with shipping. In inland cities and rural communities the most important causes of drowning might be wholly different from those on the coast. Table XI shows the mean ranking of the causes of drowning accidents for non-swimmers and swimmers and also includes the contributing factors that may have been operative in causing these accidents.

TABLE XI

AVERAGE RANKING BY EXPERTS OF CAUSES OF WATER ACCIDENTS*

Cause	Average Rank
Non-Swimmers	
1. Boat or canoe tipped over	3.4
2. Non-swimmer goes beyond depth or steps in a hole	3.4
3. Carried out by undertow or river current	4.2
4. Drowning from passenger or freight boat accident	4.5
5. Drowned in floods	5.2
6. Overloading of boat or canoe	5.2
7. Heart attack or cramps	5.7
8. Drowned after attempt at rescue by swimmer	7.2
9. Fell through ice or fell into water	7.5
10. Struck by object or injured by blow	9.4
11. Fell into water in home—old well, cistern or bath tub	10.0
Swimmers	
1. Poor swimmer trying to swim too far without protection	2.0
2. Stomach cramps, other cramps or heart disease	2.1
3. Solitary swimming (going swimming alone and causes unknown)	3.0
4. Carried out by undertows or current	4.0
5. Drowned trying to save another person	4.9
6. Swimmer but drowned by long immersion in cold water or exposure	6.5
7. Boat or canoe capsized	7.0
8. Fell through ice	7.5
9. Drowned in shallow water, struck by object	8.6
† Shallow diving, diving in muddy water.	
Contributory Causes	
1. Taking chances swimming too far from shore	3.0
2. Inadequate protection at waterfront or pool	4.0
3. Disobeying instructions of life-guards	4.0
4. Going into water too soon after eating	4.1
5. Overloading boats, canoes or other craft	4.6
6. Inadequate life belts, preservers or other safety devices on private or public boats	4.6
7. Playing or fooling in a boat	5.0
8. Swimmer but did not know life saving methods and lost life trying to save another	6.4
† Going in water when fatigued or overheated.	

* Number of experts rating, 9.

† Given by raters as causes but not rated by all.

On one of the beaches of New York City during the period from 1922 to 1928 there have been 69 fatalities.

TABLE XII

CAUSES OF DROWNING FATALITIES AT CONEY ISLAND, 1922-28

Causes	Number
Non-Swimmers	
Going beyond depths or stepping into deep water	26
Suffering attack of cramps or heart attack	24
Canoe tipped over	21
Struck by object, or injured by blow	1
Swimmers	
Poor swimmer trying to swim too far without protection	7
Broken necks—caused by diving in shallow water	4
Solitary swimming (going swimming alone)	1
Stomach cramps	1
Jumped off the pier	3
Killed by lightning	1
Total	69

This table shows the relative importance of different causes of drowning at a large ocean bathing beach which is under constant supervision by life-guards.

It is impossible to secure an accurate estimate as to the total number of rescues of drowning persons during a single year. Reports of life-guards give only a rough estimate because there are many other rescues that take place which are never recorded. During 1928 the United States Volunteer Life Saving Stations reported 341 rescues, 3,785 persons given first aid treatment, 83 boats assisted, 537 persons assisted, and 15 bodies of drowned persons recovered.[15] At Ocean City, New Jersey, in 1928 where approximately 150,000 bathers are in attendance daily, 523 rescues were accomplished by the beach patrol. There is every reason to believe that besides the 8,000 drowning fatalities in a year there are a very large number of rescues of persons who were in danger.

[15] Raynor, Charles. *Report of Activities of United States Volunteer Life Saving Corps.* New York, 1928.

PREVENTION OF WATER ACCIDENTS

Health and Physical Education, Science, Life Saving Clubs

Objectives	*Materials and Activities*
To learn how to swim.	Methods of learning to swim. Where to learn to swim. The "Brink" method of teaching swimming.
To learn how to save another person's life in case of accident in the water.	How to break "holds." How to use the different "carries." How to rescue a person.
To know how to administer artificial respiration.	The prone pressure method. (See Red Cross Life Saving Manual or Boy Scout Manual "Swimming and Water Safety") The Sylvester method. (Used and recommended by the United States Coast Guard.)
To know what various organizations are doing to reduce drowning accidents.	The work of the American Red Cross. The work of the municipal lifeguards. The safety work of the Camp Directors Association and U. S. Volunteer Life Guards. The work of Boy Scouts, Girl Scouts, Campfire Girls, Y.M.C.A., and similar organizations. The value of swimming instruction in public schools.
To learn the most common errors that are made by non-swimmers which may cause accidents.	*Causes of drowning accidents (non-swimmers).* Going beyond depth or stepping in a hole. Going in a boat or canoe without knowing how to swim. Undertows and river currents. The danger of heart attacks and cramps. Overloading boats or canoes. Going on ice that is unsafe (1 inch, keep off; 2 inches, one may; 3 inches, small groups; 4 inches, "O. K.") Need of care in diving in shallow water or diving when unable to swim. Water hazards about the home in which infants may drown (cisterns, tubs, wells, etc.) Some dangers of using water wings.

Objectives	*Materials and Activities*
To learn some of the common errors made by swimmers which may result in accidents.	*Causes of Drowning Accidents to Swimmers.* Poor swimmer going beyond depth without adequate protection. The danger of cramps and heart trouble. What to do in case of cramps. Going swimming alone or without proper protection. The dangers of undertow and currents. Trying to save a drowning person not knowing life saving methods. Going into water too soon after eating or staying in water too long. Diving into shallow or discolored water. Trying to swim to shore following capsizing of boat or canoe rather than staying by the craft. Going into water when overheated, fatigued or intoxicated. Going on unsafe ice. (See rules for unsafe ice above.)
To learn some of the contributory causes that may be factors in water accidents.	*Contributory Causes.* The importance of adequate protection of the waterfront. Taking chances by swimming too far from shore. Going into water too soon after eating. Inadequate life preservers or other safety devices on boats carrying passengers. Overloading boats or canoes. Disobeying instructions of life-guards. Playing or "fooling" in boats or canoes. Not knowing life saving methods.
To know the methods that are advocated by the American Red Cross and other organizations for the protection of the waterfront.	The organization of life-guards. Waterfront equipment and supervision. The use of the "buddy" system. Physical examination of swimmers. Teaching swimming to beginners. How to prepare for Junior Red Cross Tests—What is required in tests. (See Boy Scout or Red Cross Manuals for other methods suggested.)

Objectives	*Materials and Activities*

References

Red Cross Life Saving Methods, American Red Cross, 1928. 30 p.

Swimming and Water Safety, Boy Scouts of America, 1927. 185 p.

What to Do in Case of Accident, U. S. Public Health Service, 1928. 68 p.

First Aid, American Red Cross, 1925. 229 p.

Motion Pictures.

Every Swimmer a Life Saver.

Artificial Respiration.

Distributed by the National Safety Council and the Society for Visual Education, Chicago, Illinois.

CHAPTER IV

THE CAUSES AND PREVENTION OF HOME ACCIDENTS

It is only recently that public attention has been directed toward the problem of accidents in the home. We have been accustomed to thinking of the home as safe but studies that have been conducted in recent years indicate that in all probability as many or more fatal accidents take place in the home as in industry. In seven out of ten cities reporting home accidents to the National Safety Council[1] it was found that more than 25 per cent of all accidental deaths occurred as a result of home accidents. In addition, the city of Providence, Rhode Island, reported that in its study of accidents from 1923 to 1927 home accidents had caused 48 per cent of the accidental deaths in the city.

From the accident reporting system of the National Safety Council covering an estimated population of 20,000,000 people[2] Table XIII has been constructed to show the comparative causes of home accidents for the different age groups.

TABLE XIII

FATAL HOME INJURIES, 1927, BY TYPE OF ACCIDENT AND AGE*

Type of Home Accident (Average population 20,000,000)	Ages					
	0-4	5-14	15-54	55 and Over	Unc.	All Ages
Falls	30	18	171	381	192	792
Asphyxiation and suffocation	44	17	168	97	145	471
Burns and scalds	111	59	111	61	95	437
Fires and explosions	20	18	51	21	30	140
Poisons	32	4	73	14	7	130
Firearms	3	16	53	4	36	112
Electricity	0	3	35	4	8	50
Other home accidents	13	19	60	15	36	133
Unclassified home accidents	2	1	2	2	26	172
Total	255	155	724	599	704	2,437

*Reported to National Safety Council by cities and states.

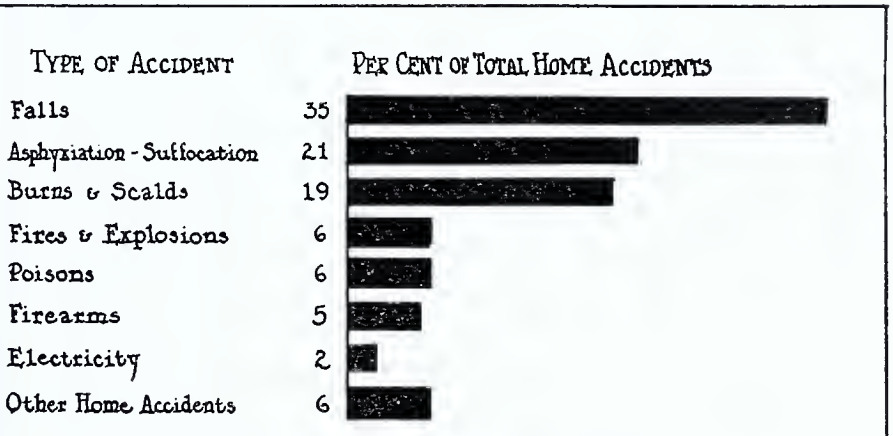
[1] National Safety Council. *Accident Facts, 1928*, p. 45.

[2] *Ibid.*, p. 6.

From this table it will be seen that the chief causes of home fatalities include falls, asphyxiation and suffocation, burns and scalds, fires and explosions, poisons, firearms, and electricity.

The returns from 46 cities reporting to the National Safety Council and insurance company reports[3] indicate that there were between 23,000 and 25,000 home fatalities in the United States in 1927. Added to this is a very large number of non-fatal home accidents. On a basis of the Travelers Insurance Company records for 30,761 claims paid in 1927 there is a ratio of 219 non-fatal accidents to 1 fatality.[4] For every fatality in the home there are approximately 200 non-fatal accidents. Although this sampling of accidents can do no more than suggest an estimate, it is probable that there are several million non-fatal home accidents each year.

In order to determine the causes of these home accidents, several of the more common types of home accidents have been studied. These include asphyxiation and other gas accidents, fires and explosions, burns and scalds, electricity, and accidents to younger children. The relative importance of several of these home accidents is shown in Figure 5. This percentage distribution is based upon records of fatalities in cities and states as reported to the



FATAL ACCIDENTS IN THE HOME - 1927
FIGURE 5

[3] National Safety Council. *Accident Facts, 1928*, p. 40.
[4] *Ibid.*, p. 40.

National Safety Council. The total population of the cities and states reporting was 20,000,000.

The experiences of insurance companies provide us with a sampling of non-fatal home accidents. From the records of the Travelers Insurance Company for 1928,[5] it was found that 5,910 or 20.8 per cent of the total of 28,351 accidents to policyholders in that year took place in or about homes; 23.8 per cent were caused by automobiles; 24.4 per cent occurred in occupational pursuits; 14.8 per cent were caused in sports; 8.8 per cent were pedestrian accidents. Obviously, accidents to policyholders would not necessarily give a valid measure of the relative importance of accidents to the whole population, but at the same time this sampling of 28,351 accidents would show the importance of accidents in the home.

Considerable difference is found in the rank order of causes of accidents by frequency between the Census Bureau reports of fatalities and the insurance company records of non-fatal accidents. According to Table XIV the rank order of the six most common causes of home accidents is: falls; cuts and lacerations; collisions with inanimate objects; burns; struck by falling objects; handling, lifting and carrying objects. The rank order for fatalities as a result of home accidents according to Figure 5 is: falls; asphyxiation and suffocation; burns and scalds; fires and explosions; poisons. The explanation of this difference is that certain kinds of non-fatal accidents such as cuts and collisions may be very common but rarely fatal, while certain other kinds of accidents such as asphyxia- and poisoning may be less common but more often result fatally.

ANALYSIS OF ACCIDENTS DUE TO MANUFACTURED AND NATURAL GAS

One of the most common types of accidents occurring in the United States has to do with manufactured and natural gas. The United States Mortality Statistics classify such accidents under the heading "Absorption of irrespirable, irritating and poisonous gases." This heading also includes a number of other gases. Although no statistics are available to show what proportion of the total of gas accidents are caused by illuminating gas, it is generally believed that a large share of the nearly 3,000 deaths which

[5] *Travelers Protection.* March, 1928, pp. 8-10.

TABLE XIV

INSURANCE RECORDS OF HOME ACCIDENTS IN 1928*
TRAVELERS INSURANCE COMPANY

Causes	Number†
Falls:	
Steps, stairs	943
Floors, rugs	442
Ladders, scaffolds	130
Uneven ground, walks	310
Over objects	150
On ice	147
Bathtubs, showers	105
Chairs, tables, windows	85
Getting in and out of bed	57
Benches or boxes	38
All others	67
Total	2,471
Cuts on broken glass	970
Collisions with inanimate objects	437
Struck by falling objects	305
Handling, lifting or carrying objects	260
Burns:	
Stoves, pipes, radiators	140
Explosions of fireworks, gasoline	105
Matches, cigars	54
Steam or hot water	44
Acids, chemicals	10
Burning buildings	5
Total burns	353
Foreign particles in the eye	157
Stepped on broken glass or nails	152
Caught in doors or windows	149
Splinters	127
Animal bites	94
Hand tools	75
Collisions with persons	62
Insect bites	61
Plants, shrubs (ivy, oak)	49
Machinery	29
Assaults	10
Asphyxiation	6
Miscellaneous	149
Total	5,910
Total amount paid to injured persons	$703,506.48
Average amount paid to policyholder	119.00

* From the records of the Travelers Insurance Company for 1928, *Travelers Protection*, March, 1928, pp. 8-10.

† Includes fatalities and non-fatalities.

occur annually is due to the latter. In addition to these deaths, a very large number of non-fatal manufactured and natural gas accidents occur which tend to make the problem of preventing home accidents a difficult one. The most comprehensive study that has been made of such accidents was completed in 1928 by the Committee on Accident Prevention of the American Gas Association. Although this study covered only a fraction of the cities and towns using gas, it provides an adequate sampling of the causes of gas accidents so that it is possible to determine the necessary educational objectives to reduce such accidents. In particular this was true of the natural gas accidents where only a very small number of the cities using this kind of gas were reported. Another very excellent study of the safe use of gas in the home was made by the National Safety Council[6] in which, in non-technical terms, the common causes of gas accidents are discussed and safe practice is suggested. The Department of Commerce published in 1918 a study[7] in which all types of home accidents were considered with particular emphasis placed on those of electrical and gas origin. Ordinarily, gas accidents result from:

a. Breathing air containing unburned gas that has escaped through leaks or unlighted burners.

b. Breathing air containing the products of incomplete combustion of gas.

c. Burns to persons or destruction of property by fire.

d. Explosion from the contact of an open flame or spark with a mixture of unburned gas and air.

Undoubtedly a large per cent of gas accidents are due to carelessness. At the same time many accidents are caused by ignorance of safe practice. Table XVI shows some of the significant causes of gas accidents.

This study of gas accidents, although it does not include all the accidents in the country, provides us with a sufficient number of cases to get at the more common causes of accidents. The data were supplied by the American Gas Association following a survey of gas accidents reported by 186 gas companies in 42 states. It is

[6] Reeder, Earl J. *Safe Use of Gas in the Home.* National Safety Council,

[7] Stratton, S. W. *Safety in the Household.* Department of Commerce. Bureau of Standards, No. 75, 1918, Washington.

evident from this table that fumes of unburned gases are a far more common cause of accidents than either fumes from burned gases, or explosions. The statistics in regard to natural gas accidents are not so valuable because they cover only a small number of companies.

Along with the dangers of gas poisoning from natural and artificial gas another serious danger has come with the automobile. A large number of asphyxiations occur each year as a result of persons running automobile motors in closed garages. Carbon monoxide gas is an important constituent of gasoline motor exhaust gases and is a deadly poison. It acts without warning and produces unconsciousness so quickly that motorists are frequently asphyxiated while working over motors or repairing other parts of the car. This is a hazard that cannot be stressed too often in our schools.

TABLE XV

ANALYSIS OF ACCIDENTS—MANUFACTURED GAS AND NATURAL GAS*
1927-1928

Type of Accident	Total Cases	Persons Injured
A. SUICIDES AND ATTEMPTS		
Suicides	225	229
Attempted suicides	108	108
Total	333	337
B. EMPLOYEES		
Unburned gas	60	65
Explosion	1	1
Total	61	66
C. PUBLIC—UNBURNED GAS		
Inferior or defective material needing adjustment	37	57
Gas accidentally turned on and not lighted	73	89
Leak in joint, split or broken pipe or fitting	164	388
Tubing accidentally disconnected	13	19
Installations or repairs by inexperienced persons	21	27
Cause not known or indicated	247	316
Wind blew out gas or pot boiled over	25	28
Total	580	924

* Statistics from the Report of the Committee on Accident Prevention, American Gas Association, New York, 1928.

TABLE XV (Continued)

Type of Accident	Total Cases	Persons Injured
D. Public—Fumes from Burned Gas		
No flue and poor or no ventilation	32	41
Improper installation	1	1
Flue or chimney stopped up or disconnected	6	11
Appliance out of adjustment or no flue	3	4
Worn out appliance	..	..
Cause not known or not reported	20	32
Total	62	89
E. Public—Explosions		
Gas turned on and not lighted promptly	33	31
Looking for a gas leak with a flame	5	5
Electric spark and gas leak	2	2
Rusted piping or fitting	1	1
Pipe or flue stopped up	..	..
Unknown or not indicated	14	16
Total	55	55
F. Natural Gas		
Suicides or attempted suicides	16	16
Employees—unburned gas and explosions	5	5
Public—fumes from gas and explosions	56	82
Total	77	103
Recapitulation		
1. Suicides and attempts	333	337
2. Employees	61	66
3. Public—unburned gas	580	924
4. Public—burned gases	62	89
5. Public—explosions	55	54
6. Natural gas accidents	77	103
Grand Total	1,168	1,574

PREVENTION OF GAS ACCIDENTS IN THE HOME

Household Arts—General Science

Objectives	*Activities and Materials*
To learn the common causes of gas accidents in the home.	These may be due to the following causes: Inferior or defective material needing adjustment. Gas accidentally turned on. Leaks in joint, pipe or fitting. Tubing accidentally disconnected. Installations by inexperienced persons. Wind blew out gas or pot boiled over. Improper flues or stove installation. Disconnected or stopped up flue. Looking for a gas leak with a flame. Turning gas burners too high.
To know the dangers of the exhaust gas of automobiles.	Carbon monoxide gas in the exhaust of motor vehicles kills many people. Do not run motors in closed garages.
To understand how to use ordinary safeguards against gas accidents.	Learning how to light gas burners or ovens. Inspecting gas stoves at home to find out whether there are hazardous installations. Finding out whether gas fireplaces at home are protected by screens. Recognizing the danger of sleeping in rooms where gas stoves are burning. Examining gas burners to see if they turn on too easily. Care in controlling the flame of gas burners.
To understand the causes of the formation of coal gases from stoves or furnaces.	The best methods of banking furnaces. How to control drafts of furnaces or stoves to prevent the formation of gases.
To know what to do when a person has been overcome by gas.	Administer "'First Aid" as recommended by American Gas Association and American Red Cross. 1. Open all windows in a room or take person into a gas free room. 2. Call the doctor if it is a serious case of gas poisoning.

Objectives	*Activities and Materials*
To know what to do when a person has been overcome by gas. (Continued.)	3. Keep the patient warm. 4. Rub arms and legs to aid in the circulation of the blood. 5. Give stimulants such as strong, black coffee and inhalations of spirits of ammonia and camphor. 6. If the doctor does not come at once, administer artificial respiration by the prone pressure method as suggested under "First Aid." 7. Keep up artificial respiration until patient recovers. (There are cases on record when patients have recovered after two hours' work.)

Source Materials

Stratton, *Safety in the Household*, Bureau of Standards, Washington, D. C.
National Safety Council, *Safe Use of Gas in the Home.*
Report of Committee on Accident Prevention, American Gas Association, 1928.
American Red Cross, *First Aid*, 1926.
First Aid and Resuscitation, American Gas Association, 1928.
United States Public Health Service, *What to Do in Case of Accident*, 1928.
Motion picture films on dangers of gas may be secured from the Bureau of Mines, Washington, D. C., and the National Safety Council, Chicago, Ill.

THE CAUSES AND PREVENTION OF THE ACCIDENTS OF PRE-SCHOOL CHILDREN

An examination of the *Mortality Statistics* for the year 1927 as shown in Table I indicates that certain kinds of accidents are relatively more common in early childhood than at any other period in life. Of the 83,408 accidental deaths reported in 1927 from 89.8 per cent of the total population in the United States, 8,150 were children under five years of age. In spite of all that has been done to protect children, early childhood is still one of the most dangerous periods in life. The importance of some of these kinds of accidents is shown by the following analysis of the 8,150 fatalities reported for 1927.

Kind of Accident	Per Cent of Total Fatalities (under 5 years of age)
Burns and scalds (conflagration excepted)	27.2
Automobiles	14.6
Mechanical suffocation	10.2
Drowning	7.4
Poisoning (excluding foods and animals)	6.6
Falls	6.5
Conflagration	4.2
Poisoning by foods and animals	3.2
All others	20.1

These accidents become all the more important when it is found that, of the total number of fatalities for all ages due to burns and scalds, 37 per cent were children under five years of age, while 75 per cent of the total number of suffocation fatalities and 34 per cent of the poisoning fatalities, were children under five. At the same time drowning accidents are relatively common in childhood, for it has been found that the largest number of drowning fatalities for any one year takes place between the ages of one and two. Bath tubs, old wells, cisterns, brooks and tubs of water frequently contribute to drowning accidents.

As shown in Figure 1, falls result in a large number of deaths in early childhood. The use of guards and railings on steps, the protection of porches, and providing a safe place for little children to play will be useful in preventing falls. It is unfortunate that

so many children are killed because of poisons. The precaution to be followed in the home is to see that all poisonous substances are kept out of reach or preferably under lock and key so that they cannot be reached. The causes and prevention of burns, the most important cause of pre-school child fatalities is taken up in Chapter V.

It is important that stress be placed at some point in the secondary school program on the prevention of some of these common accidents. The logical placement of such materials seems to be in home nursing or home planning classes.

THE CAUSES AND PREVENTION OF THE ACCIDENTS OF PRE-SCHOOL CHILDREN

Home Nursing, Home Planning

Objectives	*Activities and Materials*
To know the common causes of accidents to pre-school children.	The following are the most common accidents to pre-school children: burns and scalds, automobiles, mechanical suffocation, drowning, poisons, falls, conflagration, excessive heat, cutting and piercing instruments.
To know the hazards that may exist in or about homes.	Dangers of burns and scalds. Unprotected stoves or fireplaces. Leaving matches where children may reach them. Allowing children to build fires or play about bonfires. Using dangerous fireworks. Dangers of mechanical suffocation. Allowing children to play with certain kinds of toys.
To know how to prevent such accidents.	Drowning hazards. Cisterns, unprotected wells, brooks, tubs of water. Falls. Unprotected play spaces. Lack of guards or screens on porches. Dangers of poisons. Care should be taken not to leave medicines or poisonous antiseptics or chemicals where they can be reached by children.

Objectives	*Activities and Materials*
To know how to prevent such accidents. (Continued.)	Other dangers. Need of protection of infants from excessive heat. The dangers of allowing children to play with sharp tools. Provide children with adequate play spaces. See that stairs or steps are guarded. Do not allow children to play on dangerous streets.

THE PREVENTION OF ELECTRICAL ACCIDENTS

The introduction of electricity into a very large percentage of homes has provided a comparatively safe method for lighting, supplying heat to cooking appliances and other small heating devices, and operating a variety of types of small motor-driven apparatus. In comparison with oil lamps, acetylene, gasoline, and kerosene stoves, electricity has proved a considerably safer source of heat, light, and power. In 1925, according to the records of *The Mortality Census,* 995 fatalities were caused by electricity (excluding lightning). Of these 144 victims were between the ages of 10 and 19 and seventeen were children under 10 years of age.

In addition to the damage it has done in actual injury of persons, electricity has been one of the common causes of fires in the home although in recent years, due to improved insulation, safe electrical fixtures, and the requirements of the National Electrical Code[8] fires resulting from electricity have not been so common.

The Bureau of Standards in 1918 made a study of some of the common electrical hazards in and about the home.[9] In this study the following possible hazards were suggested:

1. Dangers of high-voltage circuits.

High voltage circuits are ordinarily used for the distribution of electrical energy about the community. Although these circuits

[8] National Board of Fire Underwriters. *National Electrical Code.* New York.

[9] *Safety in the Household,* pp. 10-44.

are ordinarily well protected by insulation, suitable elevation and clearance, several precautions should be observed by the public.

a. The danger in flying kites in the vicinity of high tension lines.

b. The danger in placing radio aerials either over or under high voltage circuits.

c. The danger in children climbing poles or trees near such lines.

d. The danger in broken wires or wires which are often sagging after sleet or wind storms.

It is important that children be instructed to keep away from electric wires and that electric light companies or other authorities be notified when wires have sagged or broken so as to be within the reach of pedestrians.

2. Electrical hazards of portable cords and devices.

The breaking down of insulation and the fraying of protective coverings of cords introduces an additional hazard. It is important that frayed cords be replaced or the condition corrected. One should avoid taking hold of electric cords or fixtures when in a bathtub or when a part of the body is in contact with water pipes or gas fixtures.

3. Dangers in overloading wires and using improper fuses.

Electric circuits are guarded by fuses. It is important that circuits not be overloaded by too many lights or heating devices. Fuses when blown out should be replaced only with fuses of suitable size and style. Fuse boxes should be protected and it is wise to throw the fuse box switch when replacing fuses. Many accidents have been caused by improper installations by incompetent people. Installations should be made by experts and approved by proper authorities.

In connection with these three types of possible hazards the Bureau of Standards suggests the following precautions which might well be included in the materials to be taught in our schools:

"a. Never touch any wire that has fallen or is sagged whether or not it is known to be an electric light wire.

b. Never climb a tree near an electric light pole.

c. Never climb an electric light or telephone pole.

d. Never throw strings, sticks or pieces of wire over electric light wires or fly kites near such wires.

e. Do not make changes in electrical installations.

f. Be sure to turn off portable heating appliances before leaving them.

g. Do not touch the interior of electric light sockets or fixtures which are used to carry current.

h. When in a bathtub or in contact with water pipes or other conductors of electricity, do not touch electrical fixtures.

i. Use only the best fixtures, cords and appliances, and replace them or have them repaired when they are worn.

j. Do not touch a person who has been shocked and is in contact with live wires unless you know how to do this without danger to yourself. Call a policeman, a fireman, or the electric light company.

k. Warn other people who are not observing the precautions given above.

l. In case of a serious accident to others call the doctor or the electric light company. If help is delayed administer artificial resuscitation as suggested under the prone pressure method.

m. Many electric light companies will come at once to replace fuses or make adjustments. Depend upon expert assistance whenever you can."

PREVENTION OF ELECTRICAL ACCIDENTS

General Seienee, Electricity, Physies

Objectives	*Activities and Materials*
To know the dangers associated with high voltage circuits.	Dangers of flying kites near high tension lines. Danger of installing radio aerials either over or under high voltage circuits. Danger of climbing poles or trees near such lines.
To know the dangers in connection with all electric light wires.	Danger of broken or sagging wires. How radio aerials should be installed.
To know the electrical hazards of cords and electrical devices.	Using frayed or worn out cords. Grasping electric fixtures and coming in contact with water or gas pipes.
To know the dangers of overloading electric circuits.	The difference in size of fuses required. Putting too many lights or heating devices on a single circuit. Replacing blown out fuses with pennies or other conducting materials is a dangerous practice. How short circuits cause fires.
To know the dangers associated with amateur electrical installations or repairs.	Many electrical accidents occur as a result of poor installations.
To know what to do when something is wrong with wires inside or around the home.	Call the electric light company. How to shut off the house circuit.
To know what to do in case of electrical accidents.	The dangers of touching a person who is in contact with "live" wires. How to administer first aid to "shocked" persons. (See prone pressure method of artificial resuscitation in Chapter III under drowning accidents.)

Source Materials

Safety for the Household, Bureau of Standards, 1918.

National Electrical Safety Code, Bureau of Standards, 1928.

CHAPTER V

THE CAUSES AND PREVENTION OF FIRES

For some time the schools have recognized the importance of fire prevention education. Many of the states have gone as far as to make such education mandatory in the public schools. Courses of study have been prepared, special days and fire prevention weeks have been set aside, and extensive literature in the field has been published. In the analysis of secondary school textbooks reported in Chapter IX it was found that the problems of fire prevention were given particular emphasis in general science, community civics, and chemistry. When the problems of forest fires were included, it was found that 20 per cent of the items as organized in the safety education test reported in Chapter X were concerned with the causes and prevention of fires.

It is important before organizing objectives and materials in this field that an explanation be given of the methods of approach.

1. *Many fires result from ignorance of the hazard involved.* Some individuals for example do not know the dangers in connection with the use of gasoline for cleaning purposes. Others ignore the dangers in leaving a smouldering campfire in the woods. These are forms of educational shortage—indications that certain individuals are not awake to possible hazards in their environment. Education which will give meaning and information concerning the many thousands of fire hazards will assist in remedying this shortage.

2. *Many fires are the outgrowth of carelessness or thoughtlessness.* The housewife who fails to turn off an electric iron before leaving the room and returns in a few minutes to find the room in flames, probably knows the danger associated with doing this, but she is careless. Campers and hunters cause many thousands of fires annually in the United States by carelessness with matches and campfires. It is necessary, therefore, to find out in what directions people are careless and provide education to reduce such carelessness.

3. *Society has found ways of preventing fires and fighting fires after they are once started.* Many communities, in the face

of national increases in fire losses, have been able to show significant reductions. Since the real measure of the success of fire prevention programs is the reduction of the number of fires and the amount of fire losses, we need to know what is being done in such communities. By analyzing the fire prevention activities of certain cities the contributing factors may be located. Moreover, certain information is necessary so that people will know how to prevent fires in their own homes and what to do when fires have started. Many lives have been saved and property losses prevented by individuals knowing what to do.

These three methods of approach, therefore, involve: 1. An analysis of the common errors or forms of carelessness by which fires are caused; 2. An analysis of successful programs of fire prevention; 3. An examination of the most effective methods of fighting fires. In order to do this studies will be made of the following data:

1. The causes and amount of fire losses in the United States.
2. The causes of fires in St. Louis, Detroit, Worcester, Massachusetts, and Los Angeles.
3. The injuries and loss of life due to fires in four states.
4. The reduction of fire losses in certain American cities.
5. The methods of fire prevention in certain cities which have been successful in reducing fire losses.
6. The causes of forest fires in the United States.

In 1914, according to the Bureau of Census Statistics,[1] there were 8,956 fatalities from burns and conflagrations in continental United States. Of this number 3,749 or 41.8 of the total were children under 15 years of age. In 1925[2] the number of fatalities due to both causes was 8,647, an encouraging decrease from the number in 1914 despite the increase in population during this period. Of this total 3,128 or 36.2 per cent were children under 15. It is apparent that during the last decade there has been a considerable

[1] *Mortality Statistics.* Department of Commerce, 1914.
[2] *Ibid.*, Report for 1925.

decrease in the relative importance of burns and conflagrations as a cause of death in childhood.

However, since burns and conflagrations in 1925 caused 32 per cent of all accidental deaths of children under five years of age and 13 per cent of all accidental deaths of children of school age, they are still to be considered as two of the greatest dangers of childhood, ranking first in order of importance in the pre-school age and third in the period of school age.[3]

The National Safety Council[4] found that 25 per cent of all home fatalities in 1927 resulted from burns and fires. It is therefore important that a study be made of the specific causes of fires so that educational objectives may be organized on the basis of the apparent educational shortage.

Not only do we have a large number of fatal and non-fatal accidents due to fires but the property loss during the past decade has been large. However, a very significant change in the amount of property losses was noticeable in 1927. For many years, according to the National Fire Protection Association,[5] property losses had been increasing yearly. Between 1916 and 1924 the figures grew from $258,377,952 to $560,548,624 —an increase of 118 per cent. However, from 1926 to 1927 fire losses have shown a decrease from $561,955,751 to $472,933,969. Whether or not the work that has been done in safety education, the increase in fireproof construction, the improved safeguards and fire-fighting methods, the more rigid building inspection, and increased precautions in other directions, have turned the tide cannot be definitely determined at the present time. The fact remains that fire losses in 1927 were lower than in 1926.

Table XVI shows the fire losses in the United States for 1926 and 1927 by causes, according to the records of the National Board of Fire Underwriters.

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[3] *Mortality Statistics*, 1927. Table 8, Part IV.

[4] See Figure 5.

[5] National Fire Protection Association. *Facts about Fire*, 1928, p. 15.

TABLE XVI

AMERICAN FIRE LOSSES FOR THE YEARS 1926 AND 1927*

Causes	Losses	
	1926	1927
STRICTLY PREVENTABLE:		
Matches and smoking	$30,160,233	$29,345,929
Defective chimneys and flues	23,111,618	19,523,904
Stoves, furnaces, boilers and pipes	21,977,144	17,986,432
Petroleum and its products	14,978,599	12,691,718
Sparks on roofs	14,172,947	11,256,303
Hot ashes and coals, open fires	6,851,460	5,171,491
Open lights	3,142,172	3,578,701
Gas, natural and artificial	2,827,355	3,100,828
Ignition of hot grease, tar, wax, etc.	1,830,240	1,699,208
Rubbish and litter	1,809,136	1,035,454
Fireworks and firecrackers	718,942	893,663
Steam and hot water pipes	395,640	184,931
PARTLY PREVENTABLE:		
Exposure (including conflagration)	54,074,554	45,082,747
Lightning	18,205,326	9,084,630
Electricity	13,783,303	12,360,558
Spontaneous combustion	15,498,812	13,640,804
Sparks from machinery	8,324,071	5,812,466
Sparks from combustion	6,343,519	4,121,148
Miscellaneous known causes	4,191,737	3,408,359
Explosions	2,565,596	4,725,857
Incendiarism	2,202,492	2,403,615
UNKNOWN:		
(Probably largely preventable)	202,369,737	171,038,429
Total Reported Losses	$449,584,601	$378,347,175
†Grand Total Losses	561,955,751	472,933,969

* As reported by National Fire Protection Association, 1926 and 1927.

† It is customary to add 25 per cent to the reported fire losses to provide for losses not reported.

CAUSES OF FIRES IN CERTAIN CITIES

In order to provide objective evidence for organizing objectives and materials in fire prevention, it was necessary to determine the specific causes of fires in several cities. Detroit, St. Louis, Los Angeles, and Worcester, Massachusetts were selected for this study because of the availability of data from the fire departments of these cities. Table XVI gives the most common general causes of fires but does not show specific causes. The statistics of fire departments may not be wholly reliable because in many cases the cause of fire may not definitely be known, but such statistics constitute the only data of specific causes of fire that are available.

TABLE XVII

CAUSES OF FIRES IN DETROIT, ST. LOUIS, LOS ANGELES AND WORCESTER*

Causes	St. Louis 1926	Detroit 1928	Worcester 1925	Los Angeles 1928	Total
1. CARELESSNESS WITH MATCHES AND SMOKING—TOTAL	310	1,587	402	748	3,047
a. Children playing with matches	71	493	142	89	795
b. Careless use of matches by others	89	228	136	98	551
c. Cigars and cigarettes thrown away carelessly	127	866	103	561	1,657
d. Smoking in bed	23	..	10	..	33†
e. Rats and matches	..	..	11	..	11†
2. DEFECTIVE FLUES AND CHIMNEYS —TOTAL	281	580	188	216	1,265
a. Defective flues	194	178	163	117	652
b. Burning chimneys	87	402	25	99	613
3. SPARKS ON ROOFS—TOTAL	689	1,764	71	386	2,910
a. Sparks from chimneys	628	1,588	34	231	2,481
b. Sparks from locomotives	41	31	9	16	97
c. Sparks from other devices	20	145	28	139	332
4. STOVES, FURNACES, BOILERS, AND HEATERS—TOTAL	300	659	84	419	1,462
a. Overheated stoves and furnaces	175	258	26	262	721
b. Overheated electric irons	15	104	9	71	199
c. Overheated ovens	16	3	..	15	34
d. Carelessness with electric irons	20	..	..	28	48
e. Defective oil burners	28	22	29	..	79
f. Explosions of stoves or heaters	46	..	20	43	109
g. Heaters too near woodwork	..	272	..	..	272

* Fire statistics were taken from the following sources:
Annual Report of Fire Department, Los Angeles, 1928.
Annual Report of Fire Prevention Bureau, Detroit, 1928.
Annual Report of Division of Fire Prevention, St. Louis, 1926.
Report of Fire Chief, Worcester, Massachusetts, 1925.

†Not complete because specific cause not given in all cities.

TABLE XVII—*Continued*

CAUSES OF FIRES IN DETROIT, ST. LOUIS, LOS ANGELES AND WORCESTER

Causes	St. Louis 1926	Detroit 1928	Worcester 1925	Los Angeles 1928	Total
5. HOT ASHES, COALS, OPEN FIRES—TOTAL	256	252	45	39	592
a. Hot ashes starting fire	206	163	38	..	407
b. Defective open grates	33	13	3	39	88
c. Wood too near stove	2	..	..	..	2
d. Lace curtains or clothing too near fire or gas jet	15	76	4	..	95*
6. FIRES DUE TO PETROLEUM AND ITS PRODUCTS—TOTAL	140	237	63	176	616
a. Ignition of alcohol, gasoline, oils	53	141	32	148	374
b. Starting fire with kerosene or gasoline	5	..	..	4	9*
c. Cleaning with gasoline	44	..	..	..	44
d. Overturned oil stoves or lamps	10	37	23	19	89
e. Oil burners ignited	28	59	8	5	100
7. FIRES DUE TO BURNING GAS—TOTAL	20	46	12	18	96
a. Hot water heaters and gas heaters	4	..	9	..	13*
b. Gas jets and pipes	3	..	..	..	3*
c. Explosions of gas	9	..	3	18	30*
d. Ignition of gas stoves	4	..	..	..	4*
8. FIREWORKS AND FIRECRACKERS—TOTAL	19	†	9	27	55
9. SPONTANEOUS COMBUSTION—TOTAL	117	173	86	168	544
a. Fires started by oil rags, chemicals, or in rubbish piles	117	173	86	168	544
10. STEAM AND HOT WATER PIPES—TOTAL	53	28	45	70	196
a. Thawing water pipes or gas pipes	31	28	23	..	82
b. Burst steam and hot water pipes (not fires but causing damages)	14	..	15	..	29
c. Burst ammonia pipes and gas pipes	8	..	7	70	85
11. INCENDIARY FIRES—TOTAL	45	177	8	52	282
a. Set by boys	14	..	..	..	14
b. Started by burglars	10	..	..	..	10
c. Started by tramps	7	75	..	..	82
d. Apparently incendiary	14	102	..	..	116

*Not complete because specific cause not given in all cities.

†Not distinguished from other causes in 1928—7 fires in 1927.

TABLE XVII—*Continued*

CAUSES OF FIRES IN DETROIT, ST. LOUIS, LOS ANGELES AND WORCESTER

Causes	St. Louis 1926	Detroit 1928	Worcester 1925	Los Angeles 1928	Total
12. IGNITION OF HOT GREASE, OIL, ETC.—TOTAL	63	110	23	179	375
a. Fires started by burning grease	12	76	23	54	165
b. Burning meat	25	11	..	72	108
c. Fires started from dripping meats	8	..	..	..	8
d. Fires started from oils and turpentine	14	23	..	53	90
e. Fires started from overboiling paraffin	4	..	..	..	4
13. DEFECTIVE WIRING—TOTAL	690	421	109	638	1,858
a. Defective wiring in buildings	294	421	109	638	1,462
b. Defective wiring in automobiles	396	*	..	..	396
14. MISCELLANEOUS FIRES—TOTAL	1,706	1,629	706	4,503	8,544
a. Caused by friction	23	16	1	19	59
b. Caused in fumigation of buildings	10	..	..	..	10
c. Rubbish fires, grass, weeds	827	1,221	618	3,782	6,448
d. Struck by lightning	24	10	9	..	43
e. Cause unknown	725	382	21	543	1,671
f. Backfires	97	..	57	159	313
15. OTHER CALLS BY FIRE DEPARTMENT FOR MISCELLANEOUS PURPOSES—TOTAL	2,987	4,588	194	2,430	10,199
a. Automobiles on fires	591	1,575	9	..	2,175
b. Sprinkler alarms	616	..	..	..	616†
c. False alarms	687	1,228	77	1,057	3,049
d. Motion picture film	..	7	..	12	19†
e. Street car fires	..	113	13	..	126†
f. All others	1,093	1,665	95	1,361	4,214
Grand total fires and alarms	7,676	12,251	2,045	10,069	32,041
Estimated loss (thousands)	$3,251	$3,682	$600	$2,271	$9,804

* Included under automobile fires.

† Not complete because specific cause not given in all cities.

It is impossible to determine the reliability of the statistics given in Table XVII, but for the purposes for which they are to be used they are sufficiently accurate. It will be seen that there is considerable variation in the frequencies of certain kinds of fires in different cities. This would tend to show that some cities have their special fire problems. Memphis, for example, has many grass fires; Detroit appears to have an unusual number of fires caused by matches and smoking; Los Angeles has numerous grass and rubbish fires.

In general, however, the causes of fires that have been shown here would be typical of most American cities. Naturally there would be considerable difference in fire causes in cities in the North and those in the South. Again, the types of construction of dwellings make considerable difference. Since fires in homes are by far the most numerous, home fire prevention is perhaps the most important part of the prevention program. Fires due to lightning do not appear to be very common in cities, but in rural communities might have a much more important place.

There is considerable difference between the educational significance of some of these causes of fires. Naturally the heaviest emphasis needs to be placed on preventable fires and to a lesser degree on those that are only partially preventable. Authorities differ in their estimates of the percentage of preventable fires and fire losses, but the National Board of Fire Underwriters, in a study covering five years, estimates that "25.4 per cent of the fires in the United States came from strictly preventable causes, while 42.8 per cent were partly preventable, and 31.8 per cent came from unknown causes, which probably were largely preventable." For these reasons, in the organization of objectives at the end of this chapter, some allowance must be made for the relative importance of the various fire causes, not only on a basis of their relative frequency, but most of all on a basis of what the individual can do to prevent such fires. It is readily seen that although sparks from chimneys, electrical short circuits and lightning may cause numerous fires, there is very little that the individual can do directly to prevent such fires except see that his home is well constructed and that electric installations are approved. On the other hand, the individual is directly responsible for the many fires caused by matches, smoking, and overheated stoves. Fire prevention education should, therefore, be directed primarily toward preventable fires.

It is important at this time to determine some of the fire prevention activities of various cities that have been able to reduce fire losses. A study of the statistics of the National Board of Fire Underwriters for 1927[6] showed that the per capita fire loss in 1927 for the country as a whole was $4.01 and loss for cities was $2.82. Certain cities in spite of the increasing national fire losses in the past ten years have been able to report a steady decrease. No single city could be used as a basis of evidence as to the value of fire prevention because one or two large fires might materially distort the losses in any one year. The investigator has therefore selected eleven cities, ranging from 100,000 to over 1,000,000 population, which have had a very definite decrease in per capita fire loss. The cities selected and the per capita losses since 1923 are shown in Table XVIII.

TABLE XVIII

PER CAPITA FIRE LOSSES IN CERTAIN CITIES FROM 1923 TO 1927*

City	Per Capita Fire Loss						
	1923	1924	1925	1926	1927	Avg.	% Decr. 1923-27
Detroit†	$3.99	$3.17	$3.16	$2.73	$3.27	$3.26	18.0
Los Angeles†	1.67	1.61	1.47	1.77	1.60	1.62	4.2
Milwaukee	3.91	2.94	2.84	2.64	1.98	2.86	49.1
Kansas City, Mo.	7.18	6.95	8.95	4.13	3.17	6.68	56.0
Louisville	6.69	3.51	4.46	4.30	2.09	4.21	68.7
Indianapolis	4.23	3.47	3.38	1.82	2.01	3.36	52.5
Portland, Ore.†	4.51	3.48	3.69	3.01	2.09	3.36	53.6
Seattle†	1.51	1.66	3.66	1.40	1.36	1.92	10.0
Memphis†	6.04	4.13	5.44	3.36	2.88	4.37	52.3
Grand Rapids‡	8.03	6.90	4.98	1.90	1.73	4.71	78.4
Springfield, Mass.	6.14	2.82	2.76	3.10	2.43	3.45	60.4
Average	5.27	3.69	4.07	2.83	2.24	3.56	45.0
National Average	4.79	4.83	4.76	4.79	4.03	4.64	1.6

* Statistics from National Board of Fire Underwriters.

† These cities were winners or honor cities in the Nat'l Fire Waste Contest conducted by the National Fire Waste Council and the U. S. Chamber of Commerce in 1928.

‡ Population taken from United States Census Bureau estimates.

[6] Report of National Board of Fire Underwriters. *The 1927 Fire Loss*, 30 p.

This table shows that in the eleven *cities* selected the average decrease in per capita fire loss from 1923 to 1927 was 45 per cent while the *national* per capita fire loss decreased only 1.6 per cent during the same time. It is evident from an examination of this table that the real measure of the progress in fire prevention in a city is shown by a consistent downward movement of the per capita fire losses.

A study was then made of the fire prevention activities in seven of these cities. Reports of activities were secured from each city and the common fire prevention activities in the various cities are listed as follows:

Activities in Seven Cities	Number of Cities Reporting
Inspection of buildings, garages, schools, and theatres	7
Re-inspection of buildings, garages, schools and theatres	7
Correcting violations of ordinances	7
Investigating complaints from citizens	6
Special details to churches, schools, theatres (night work)	7
Granting licenses and permits to garages, motion picture operators, dry cleaners, etc	7
Giving fire prevention instructions in schools	7
Giving fire prevention instructions to clubs, churches, and other public meeting places	7
Giving radio broadcasting programs	6
Giving motion pictures on fire prevention in theatres	2
Making investigations of fires	7
Having a fire college or fire school	2
Having a fire prevention week campaign	7
Distributing fire prevention posters or booklets	6
Conducting annual "cleanup" or "paintup" campaigns	5

The quality of these fire prevention activities cannot be evaluated from any of the reports that are available. Indianapolis, for example, reported a considerably larger number of building inspections than other cities but showed a much smaller number of violations corrected. On the other hand, Detroit did not report as large a number of inspections but showed that a very large number of violations of ordinances had been corrected. As a matter of fact there is no agreement as to what constitutes an inspection. Similarly many of these cities go carefully into the investigation of incendiary fires; others feature the school fire prevention program; still others distribute a large amount of fire prevention materials, hold expositions and emphasize general fire prevention. It is evident that such

programs as are common to these cities have in all probability been instrumental in reducing fire losses.

It should be stated at this time that the cities which have been studied are not the only communities that have had unusual success in reducing fire losses. Many other cities, particularly those with a population under 100,000, have been equally successful. The eleven cities were selected because they were representative and data regarding fire losses and fire prevention programs could be secured.

With reference to school fires some evidence is available. Since 1917, according to the records of the National Fire Protection Association,[7] there have been 423 lives lost as a result of school fires. In the same period there have been 524 school fires as follows: 149 in elementary schools; 105 in high schools; 54 in classrooms of private schools or universities; 109 in dormitories; 47 in workshops or laboratories; 60 in miscellaneous buildings. However, in recent years the construction of fireproof or semi-fireproof buildings has materially decreased the danger of fires.

In considering the problem of the causes and prevention of fires one other subject deserves some attention. According to the records of the American Museum of Safety, which conducted a survey of Independence Day casualties in more than 600 cities in 43 states, 195 deaths and 3,179 injuries were caused on this date in 1927.[8]

"Of the 195 killed, 31 were children under six years of age, and 122 were between the ages of six and twenty. Firecrackers, toy pistols, small cannon, Roman candles—even dynamite added to the toll." According to this survey, 48 were burned to death, 46 were killed by blank cartridges, firecrackers killed 22, and 16 deaths were caused by small children eating fireworks. It is probable that this survey does not show all of the accidents caused by fireworks, as in St. Louis, where a careful system of reporting accidents is used, 228 injuries were recorded while New York reported only 58, Chicago 51, and Brooklyn 40. More accurate records in cities would probably reveal a considerably larger number of injuries. These facts show that although America has improved considerably

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[7] National Fire Protection Association. "Loss of Life in School Fires." *Quarterly of the N. F. P. A.*, October, 1927, p. 165.

[8] "The Fourth of July Toll." *The National Fire Protection Association Magazine.* October, 1927, pp. 124-126.

in the past twenty-five years in an attempt to observe a "safe and sane Independence Day," there is still plenty of room for improvement.[9]

The following curriculum is suggested for teaching fire prevention and fire fighting in general science, community civics, and extra-curricular activities.

FIRE PREVENTION

General Science—Community Civics or Extra-Curricular Activities in Fire Prevention

Objectives	*Materials and Activities*
To observe precaution in regard to matches and smoking.	Finding out the causes of fires in the community. Finding the per cent of fires due to matches and smoking. Matches and smoking the largest individual cause of preventable fires in 1926 and 1927. ($29,345,929 loss in 1927.) The advantage of using safety matches.
To understand the necessity for care in the use of stoves, boilers and furnaces.	Finding out how fires are caused. a. Overheating stoves and furnaces. b. Using defective oil burners or heaters. c. Having heaters too near woodwork. d. Carelessness in overheating ovens. e. Careless with electric heaters. ($17,986,432 damage in 1927 in United States due to these causes.)
To understand the importance of having flues and chimneys inspected and cleaned.	How dirty flues or chimneys cause fires. ($5,171,491 national loss in 1927.) The danger of leaking flues or chimneys. How to have chimneys cleaned. (These hazards rank second as causes of national losses due to preventable fires, $19,523,904 loss in 1927.)
To exercise precautions relative to hot ashes, open grates and fireplaces.	How hot ashes cause fires. The best ways of storing ashes. The hazards of open grates and fire-places. Inspecting homes for dangerous fire hazards.

[9] The American Medical Association reported 466 fatalities and 3,983 injuries in 1903 caused by fireworks.

Objectives	*Materials and Activities*
To see that rubbish and litter is kept cleaned up and oily rags are placed in proper receptacles.	How rubbish and litter contribute to fires. How oily rags may cause fires. How spontaneous combustion causes fires in piles of coal and in damp hay in barns.
To understand the dangers in starting bonfires or burning rubbish.	In many cities these fires are very numerous. Steps advisable before burning rubbish. Although these fires do not cause a large property loss, in many cities they are most numerous.
To know the hazards in regard to electric heaters, flat irons and other electric devices.	How flat irons may cause fires. The dangers of overloading electric currents. How short circuits may cause fires. How fires due to lightning may be prevented. The dangers of poor electrical installations. (Amateur wiring.) How to shut off electric current in a house.
To observe precautions with using gasoline, kerosene and other inflammable oils.	Shutting off motors when stopping to get gasoline. The dangers of smoking near gasoline tanks. Where to keep gasoline supply in the home. The danger of cleaning with gasoline. Substitutes for gasoline for cleaning. Dangers of starting fires with oils. Precautions necessary in using kerosene or gasoline stoves or lamps. (National fire loss in 1927, $12,691,718.)
To observe precautions in handling gas, candles and various kinds of lamps.	Precautions necessary in using acetylene lamps. Dangers in the use of candles. Dangers in filling lamps without extinguishing flames. How to light a gas oven. The dangers of looking for gas leaks with matches.
To observe care in regard to using fireworks.	The dangers of using fireworks. How Independence Day may be celebrated without dangerous fireworks. National losses due to fireworks.

Objectives	*Materials and Activities*
To be able to inspect homes to locate common fire hazards.	To cooperate with fire prevention campaigns in making home inspections. The importance of trying to correct home fire hazards. What to look for in making a home inspection. (See "Safeguarding the Home Against Fire," National Board of Fire Underwriters.) Reporting fire hazards to the fire department.
To use precaution in regard to hot grease, turpentine and oils.	How hot grease may cause fires. The dangers of heating oils on stoves.
Objectives in Fighting Fires	
How to use fire extinguishers.	The action of the different kinds of fire extinguishers — pyrene, foamite, etc. How to use school fire extinguishers. The value of extinguishers on automobiles and airplanes. How to get an extinguisher recharged.
How to call the fire department.	The location of the fire alarm box nearest to school and to home. How to call by telephone.
To know what to do when someone's clothes catch on fire.	Not to run outdoors. Roll in blanket, rug or overcoat. Roll slowly on floor. Extinguish fire with water or extinguisher if handy. How to treat burns.
To know how to escape from a smoke filled room.	How to use the fireman's "drag." Where one can usually find the best air in a smoke filled room. What to do to administer first aid to a person suffocated from smoke.
To know how to put out fires that have just started.	Using extinguishers. Using water or sand. Using damp blankets or sacks. How to fight gasoline fires.
To know how to put out a fire in an automobile.	How automobile fires are caused. How to prevent fires in automobile brakes. How to extinguish automobile fires. The value of fireproof garages.

Objectives of Fire Prevention in a Community	*Materials and Activities*
To know what communities are doing to prevent and combat fires.	The fire prevention work in the local community. How fire prevention programs are reducing fire losses. Fire prevention program of a typical city, inspections and reinspections; correcting fire hazards; investigating fires; fire prevention in schools; investigating complaints; giving permits for gasoline stations, etc., details of firemen for evening entertainments; fire colleges; fire prevention talks in public meetings; fire prevention and "cleanup" campaigns. The value of modern fire apparatus in fighting fires. The value of school fire drills. How theatres are protected against fires. How fireproof buildings, firedoors, and firewalls reduce fire dangers.
To know what fire underwriters are doing to prevent fires.	Why fire underwriters are interested in fire prevention. How electrical "codes" are established. How fire insurance companies determine rates for insurance. Preventative methods used by fire underwriters. a. Inspections of insured buildings. b. Distributing literature on fire prevention. c. Standards for various insurance rates.
	Source Materials for Fire Prevention *Safeguarding the Home Against Fire*, National Board of Fire Underwriters. *Fire Prevention Week Handbook*, National Fire Protection Association, 1926. *National Fire Protection Association Quarterly*, Issued quarterly by the N. F. P. A., Boston, Mass. Films and slides on Fire Prevention may be secured from the National Board of Fire Underwriters, the National Safety Council or other film supply agencies.

THE CAUSES OF FOREST FIRES IN THE UNITED STATES

The problem of forest fires concerns everyone in our country. It is not only the monetary loss that results from the burning over of large areas of forest land, but there is also the immeasurable loss in natural scenery, soil deterioration, loss of wild life, uncertain stream flow, and the decay of damaged timber. "Everyone Loses when Forests Burn" has been a very appropriate slogan of the Forest Service, for in 1926, according to the records of the Forest Fire Statistics Department,[10] a total of 91,793 fires burned over an area of 24,316,133 acres and caused a loss of $29,041,140. It is significant that in the protected area, which included 339,227,910 acres, there were 33,867 fires that burned over 4,035,063 acres or one per cent of the acreage under protection, while in the unprotected area of 529,850,290 acres, there were 57,926 fires, which burned over an area of 19,561,504 acres or nearly four per cent of the area without protection. It is quite evident from this that the various methods of fire prevention utilized by the Forest Service are effective in reducing fires and decreasing the area over which fires may burn after they are once started.

TABLE XIX

FOREST FIRE STATISTICS FOR THE UNITED STATES (EXCLUSIVE OF ALASKA)*

Number of Fires by Causes and Damages, 1926

Causes in Protected Area	Number	Per Cent	Damage	Per Cent of Total Damage
1. Smokers	5,625	16.6	$897,798	7.9
2. Railroads	4,642	13.8	1,150,199	8.8
3. Lightning	4,121	12.0	4,061,410	31.0
4. Brush burning	4,075	12.3	1,031,842	7.9
5. Incendiarism	3,272	9.7	1,939,914	14.8
6. Camp fires	2,496	7.4	343,666	2.6
7. Lumbering	1,531	4.5	758,631	5.8
8. Miscellaneous	2,903	8.8	1,240,772	9.5
9. Unknown	5,202	16.2	1,664,576	12.7
Total	33,867	100.0	$13,092,802	100.0
†Unprotected Area	57,926	....	15,048,260	....
Grand Total	91,793	....	29,041,140	....

* From the Forest Service Report of 1928.

† Data not available for causes on unprotected area.

[10] *Forest Fire Statistics of the United States.* Published by the United States Dept. of Agriculture, Forest Service, June, 1928.

PREVENTION OF FOREST DESTRUCTION

Community Civics—General Science

Objectives	*Materials and Activities*
To learn how and where to build camp fires when in forests.	Method of building fires. Best places to build fires. (Near brooks in protected places, etc.) Learn how to extinguish a forest fire.
To learn how to extinguish camp fires.	The values of forests. Conserving the stream flow. Providing timber.
To know the importance of exercising care with matches and smoking when in forests.	Forests as refuges for birds and animals. The prevention of floods. The value of forests as National scenery.
To know the values of forests.	Commercial products made from wood.
To know the causes of forest fires and the losses caused by fires.	Causes of forest fires. Matches and smoking. Lightning. Railroads and lumbering. Burning brush. Campfires. Losses due to fires. Damages to timber. Killing the reproduction. Killing of animal and plant life. The effect of the destruction of forests upon stream flow.
To learn of some of the other causes of forest destruction.	Losses due to wasteful lumbering, grazing, insects, plant diseases, weather, etc. (See U. S. Forest Service Publication, Circular 211 on Government Forest Work)
To learn what the Forest Service and other agencies are doing to prevent forest destruction.	See Appendix B—The Work of the Forest Service. Selected References. United States Department of Agriculture Publications. 1. *A Forest Fire Prevention Handbook for School Children*, No. 79, 1926, p. 30. 2. *A Forest Fire Prevention Handbook for the Schools of Washington*, No. 40, 1928, p. 32. 3. *Government Forest Work*, Circular 211, p. 44. 4. *Forests and Waters in the Light of Scientific Research*. 1927.

CHAPTER VI

SAFETY IN INDUSTRY AND TRANSPORTATION

In order that pupils may learn some of the common safety activities by which industries, public service and transportation agencies are attempting to protect the people, it is necessary that an analysis be made of the common activities of these agencies so that curriculum materials may be provided. A very large percentage of the school population will sooner or later find their way into employment in one of these activities. Although the pupils cannot be expected to learn the specific safety activities of various industries, nevertheless, they should know the activities which are common to industries in general, so that they may better appreciate what is being done and know their own responsibilities for preventing accidents. Furthermore, safety in transportation concerns everyone for in 1927, over 841,000,000 passengers were carried on steam railroads, an even larger number on electric railroads, over 230,000,000 on steam vessels and over 770,000 in airplanes.

In order to determine these common safety activities, a study has been made of four problems:

1. What industry is doing to safeguard its workers.
2. Making transportation on steam and electric railroads safer.
3. Safety in aviation.
4. The prevention of accidents in water transportation.

WHAT INDUSTRY IS DOING TO SAFEGUARD ITS WORKERS

One of the outstanding safety records has been the work of the industries of the United States in reducing accidents and loss of property. Industry was perhaps the first to recognize the serious waste due to accidents. Not only has there been a serious loss of life and a large number of temporary and permanent disability losses, but there was also a huge economic loss, which, in 1923, was estimated by Hookstadt[1] to be the equivalent to a loss of 227,169,970 working days or $1,022,264,866 in wages. Approximately

[1] Hookstadt, Carl. "Estimated Annual Number and Cost of Industrial Accidents in the United States." *Monthly Labor Rev.*, U. S. Bureau of Labor Statistics, 1923, 17, 5, p. 991.

two-thirds of this loss is borne by employees and their dependents while the remaining one-third is borne by employers. Hookstadt's[2] study of losses in 1923 showed the following distribution of industrial accidents:

Deaths	21,232
Permanent total disability cases	1,728
Permanent partial disability cases	105,629
Temporary total disability cases	2,324,829

According to DeBlois, "It is estimated that seven per cent of the 42,000,000 persons gainfully employed are injured each year, and the entire working population pays annually for industrial injuries a tax on its earning which has been variously estimated at from 2 to 4 per cent."[3]

Industrial accidents therefore concern everybody and it is quite important that secondary school pupils understand and appreciate the significance of the safety movement in industry. There is every reason to believe that if people understand what is going on, what the safety program includes, that they will be more ready to cöoperate and help in trying to prevent accidents.

Without any question the trend in accidents in many industries has been downward, although it is impossible to say with certainty that industrial accident rates in the United States have decreased. Although much very fine work in accident prevention has been done by many industries, nevertheless, in others there has been very little done in the form of an organized attempt at a safety program.

De Blois[4] points out that "The influence in the movement for industrial safety in the iron and steel industry, the mines and railroads has been due to the dominant influence of four types of leadership:

1. Leadership of outstanding men.
2. Leadership of progressive corporations.
3. Federal leadership.
4. Leadership of industrial organizations."

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[2] *Op. cit.*

[3] DeBlois, Lewis A. *Industrial Safety Organization.* New York: McGraw-Hill Book Company, 1926, p. 4.

[4] *Ibid.*, p. 4.

Judge Gary of the United States Steel Corporation, Lucian Chaney of the United States Bureau of Labor Statistics, and Dr. Joseph Holmes of the Bureau of Mines have been outstanding leaders. The United States Steel Corporation, the E. I. du Pont de Nemours Company, and the Union Pacific Railway are examples of progressive corporations. The Bureau of Mines and Department of Labor have given outstanding federal leadership, and the National Safety Council has been the strongest and most active industrial safety organization.

For the purposes of curriculum building a brief analysis was made of two important features of the safety movement in industry:

(1) To study some of the typical accident reduction records in industry;

(2) To ascertain some of the common safety activities in industry.

Typical Accident Reduction Records[5]

1. The United States Steel Corporation: The serious accident rate was reduced 60 per cent from 1906-1925. The total number of men saved from lost time injury from 1913 to 1925, on a basis of the 1912 accident rate was 322,408.
2. Iron and steel industry: The frequency rate for accidents, or number of lost time accidents per million hours worked, was reduced from 60.3 in 1913 to 10.2 in 1924.
3. Coal mines: The fatality rates (per million hours exposure) were gradually reduced from 2.06 in 1907 to 1.20 in 1921.
4. Metal mines: The fatality rates here were reduced from 1.48 in 1911 to 1.05 in 1920.
5. Portland Cement Association: The severity rate, or the number of days lost per thousand hours worked, in these industries was reduced from 6.70 in 1919 to 3.96 in 1926.
6. E. I. du Pont de Nemours and Company: The fatality rates (per million hours exposure) were reduced from 3.50 in 1908 to 0.50 in 1920.
7. Nashville Railway and Light Company: Total accidents were reduced from 2,837 in 1920 to 840 in 1925.
8. Fisk Rubber Company: The frequency of compensable accidents, per million hours worked, was reduced from 26 in 1917 to 6 in 1924.
9. Chicago Bridge and Iron Works: The frequency rates were reduced from 104 in 1923 to 76 in 1925.

[5] Williams, Sidney J. *The Manual of Industrial Safety.* New York: A. W. Shaw Company, 1927, 197 p.

It is evident that there has been a very remarkable reduction in fatal and non-fatal accidents in those industries where a safety program has been inaugurated. Several of the larger industries such as the Edgar Thompson Works of the Carnegie Steel Company, the New England Plant of the Standard Oil Company of New Jersey, the Joliet Plant of the Illinois Steel Company, and many other different plants have established records of over 2,000,000 man-hours worked without a single lost time accident.

It is worth while to make a study of what is being done by industries in general to reduce accidents. For the purposes of this study it will not be necessary to go into all of the safety methods used in special industries but rather indicate what has been found to be effective for general safe practice. No adequate data are available as to the relative values of certain safety methods, but it is well recognized that different industries may stress various techniques and secure varying results. The studies of DeBlois[6] and Williams[7] indicate that in general the major safety activities in industry can be included in the following:

1. Frequent inspections of the plant or the job, to discover hazards both human and mechanical.
2. Providing guards for machinery and safeguarding other plant equipment and structure.
3. Campaigns, competition, and rewards.
4. Educational posters, exhibits, and publicity.
5. Safety meetings and educational classes.
6. Educating new men on the job and old men on new jobs.
7. Providing for accurate record keeping.
8. Providing safe devices for handling material.
9. Requiring protective wearing material.
10. Improving health and sanitation.
11. Fire prevention and protection against dangerous chemicals, gases, etc.
12. Providing a safety supervisor and an organization with committees for carrying out a definite safety program.

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[6] *Op. cit. Industrial Safety Organization.*

[7] *Op. cit. The Manual of Industrial Safety.*

Progressive industries have been studying very carefully the mechanical and human hazards in their plants. Hazardous methods of procedure have been eliminated and dangerous machinery has been protected by mechanical guards or other protective devices. An attempt has been made to get at the real causes of accidents so that such accidents may be eliminated.

The education and competitive programs have been very interesting features of the safety work. Employees are not only urged to prevent accidents because of the hardship that may be caused to themselves and their families, but through competition and "no accident" campaigns they are motivated to be safe so as not to injure the record of their plant or department. Signs are placed on dangerous places, thousands of educational posters are utilized, safety meetings are held frequently, first aid and other educational classes are organized, new employees are carefully trained on new jobs, accurate records of accidents are kept and other important educational work is carried on generally under the direction of the supervisor of safety.

Considerable attention has been focused in recent years on the prevention of occupational diseases. These include poisoning from lead, phosphorus, arsenic, brass, zinc, and other metals; benzol, creosote, turpentine, wood alcohol, ether, and other chemical products; anthrax, dust, carbon monoxide, glanders, and others. It is impossible to secure reliable statistics on the effects of these industrial poisons. Some are very subtle in their effects and may cause breakdowns in middle life often attributed to other diseases. However, the records of compensable occupational diseases for New York and Ohio tend to show that many of the dangerous diseases of twenty-five years ago such as "phossy jaw," due to phosphorus poisoning and benzol poisoning have been almost eliminated. The records of compensable occupational diseases in New York State[8] showed that there were 342 cases of compensation awards in 1926 due to poisonous substances; 824 were due to corrosive substances, such as lime, cement, acids and alkalis; 271 cases were due to occupational diseases. Of the occupational diseases, lead poisoning caused 216 of the cases, while phosphorus, zinc, benzol, mercury, and carbon disulphide are comparatively rare. In comparison with the 99,673 awards for accidents made under the provisions of the

[8] Hamilton, James A. *Causes of Compensated Accidents.* New York State Department of Labor, No. 152, August, 1927, pp. 139-142.

State Workmen's Compensation Law during the same year, it will be seen how relatively small the number of compensated occupational diseases is in comparison with compensated accidents. This statement is not given to minimize the importance of occupational diseases, but rather to suggest that our school textbooks in biology, civics and health should devote more consideration to the work in accident prevention in industry and less to occupational diseases.[9]

The National Safety Council in 1928 estimated that there were between 23,000 and 25,000 fatalities in 1927 due to industrial accidents. Added to this is a very large number of non-fatal accidents which according to the records of the Bureau of Labor Statistics[10] exist in a ratio of 131-1 to fatal accidents. The industrial age has brought with it many new hazards, and every effort must be made to locate these hazards and prevent the waste of human life and property. It is quite important that pupils in our schools know of what is being done in accident prevention so that they may cooperate in the safety program of industry.

WHAT INDUSTRY IS DOING TO SAFEGUARD WORKERS

Community Civics—Problems of Democracy

Objectives	*Materials and Activities*
To know of the extent of industrial accidents and the economic loss in industry due to accidents.	The extent of industrial accidents in the United States. How accident prevention in industry has developed. The economic waste due to accidents. Waste due to loss of life and injuries. Waste in lost time and cost of accidents. Why industries are interested in accident prevention.
To know what is being done in the industries in the community to reduce accidents.	A study of industries in the community to find out what is being done to reduce accidents. (Compare safety work in local industries with the national program in accident prevention.)

[9] In the analysis of secondary school textbooks reported in Chapter IX it was found that a large share of the items on industrial safety had to do with occupational diseases.

[10] Bureau of Labor Statistics. *Record of Industrial Accidents to 1925.* United States Department of Labor, No. 425, 1927.

Objectives	*Materials and Activities*
To know of the value of a safety program in accident prevention.	To find out what has been accomplished by certain industries in accident prevention. 1. The work of the U. S. Steel Corporation. 2. Accident reduction in mines. 3. The work of the Portland Cement Association. 4. The work of metal mines. 5. The work of other industries that have been successful in reducing accidents. 6. The relationship between safety and production.
To know what industries in general have found to be good practice in reducing accidents.	Methods that have been found useful in safety programs: 1. Frequent inspections of the plant or the job to discover hazards both human and mechanical. 2. Providing guards for machinery and safeguarding other plant equipment and structure. 3. Campaigns, competition and rewards. 4. Educational posters, exhibits and publicity. 5. Safety meetings and educational classes. 6. Educating new men on the job and old men on new jobs. 7. Providing for accurate record keeping. 8. Providing safe devices for handling material. 9. Requiring protective wearing material. (Gloves, goggles, etc.) 10. Improving health and sanitation. 11. Fire prevention and protection against dangerous chemicals, gases, etc. 12. Providing safety supervision and organization with committees for carrying out a definite safety program.

Objectives	*Materials and Activities*
To know of the importance of some of the occupational diseases in industry.	Diseases due to metal poisoning, such as lead, phosphorus, arsenic, brass and zinc. Poisoning due to chemical products, such as benzol, creosote, turpentine, wood alcohol, ether, etc. Poisoning due to corrosive substances, such as lime, cement, acids and alkalis. The comparative frequency of occupational diseases and accidents in industry. Why accurate statistics on occupational diseases are not available. How industry is preventing occupational diseases. How "caisson disease" (bends) is prevented. The comparative frequency of compensable occupational diseases.
To know what national and private organizations have been active in promoting safety in industry.	The work of the Bureau of Mines. The work of the United States Bureau of Labor Statistics. The work of state labor departments. How the provisions of the state workmen's compensation laws have influenced the movement for safety. The work of private organizations, such as the National Safety Council and insurance companies. Why insurance companies are interested in accident prevention.

The following are a few selected references which may be found useful:

DeBlois, *Industrial Safety Organization.*
Hookstadt, *U. S. Bureau of Labor Statistics*, 1923.
Williams, *The Manual of Industry Safety.*
Safe Practice Pamphlets—National Safety Council.
Safe Practice Reports of Insurance Companies.
Annals of Industrial Safety, American Academy of Political and Social Science.
Henig, *Safety Education in a Vocational School.*
American Engineering Council, *Safety and Production.*

Additional materials are available from the following sources:

Proceedings of the National Safety Council.
Bulletins of the United States Bureau of Labor.
Bulletin of State Bureaus of Labor.

MAKING TRANSPORTATION ON STEAM AND ELECTRIC RAILROAD LINES SAFER

Perhaps the most outstanding safety work in which the public is vitally interested has been the work of various agencies in making transportation safer. Conspicuous in this field has been the work of the steam and electrical railroads in the reduction of fatal and non-fatal accidents. An analysis of Table XX goes to show the work of the steam railroads in reducing accidents. However, during this period of eight years, there has been a considerable decline in the total number of passengers carried by railroads of the United States, which makes the per cent of accident reduction less significant.

TABLE XX

RAILROAD ACCIDENTS IN THE UNITED STATES*

	Total Number of Railroad Accidents	Total Persons Killed	Passengers Killed	All Employees Killed	Other Persons Killed
1918	194,553	9,994	521	3,829	5,644
1919	169,848	7,480	310	2,454	4,716
1920	198,959	7,487	255	2,898	4,334
1921	140,077	6,505	236	1,702	4,567
1922	154,653	6,801	230	1,878	4,693
1923	197,678	7,947	157	2,336	5,454
1924	164,967	7,119	185	1,784	5,150
1925	157,383	7,317	213	1,861	5,243
1926	150,579	7,644	167	1,926	5,551
Per cent Decrease 1928 to 1926	22	23	146	50	2

It is evident from this table that, while the number of accidents since 1918 has decreased 22 per cent, total persons killed 23 per cent, passengers killed 146 per cent, and employees killed 50 per cent, the total number of fatalities due to railroad accidents has varied but little in the last ten years. The explanation of this lies in the rapid increase in the number of railroad highway grade crossing accidents, which has been enough to compensate for the decrease in other railroad accidents.

* As reported by the Interstate Commerce Commission, 1927.

In the same way street car fatalities have been reduced from 2,998 in 1911 to 1,991 in 1926, a reduction of approximately 33 per cent.[11]

Not only has there been this enviable safety record on the part of railroads in decreasing the number of fatal and non-fatal accidents, but there has been a distinct decrease in the economic cost due to accidents. A number of factors have been important in influencing this reduction. Just how much each factor has contributed, it is impossible to estimate. Among these the following have been most useful:

1. The inauguration and carrying out of a safety program involving the analysis of causes of accidents, education, competition, and publicity such as used in the industrial safety program mentioned under industrial safety methods.
2. The improvement of safety devices including couplers, automatic signals, warning devices at crossings, automatic switches, etc.
3. The inspectional program as carried on by the Interstate Commerce Commission for inspecting brakes, couplers, locomotives, hours of service, block-signals, etc.
4. The improvement of the railroad equipment including cars, right of way, locomotives, etc.
5. The elimination of grade crossings.
6. Keeping trespassers off the right of way. (It is interesting to note that one-third of the fatal injuries that occur on railroads are chargeable to trespassing on tracks.[12]

Safety on railroads, street cars and other kinds of transportation concerns everyone. In the first place, according to records of the Bureau of Railway News and Statistics, 841,178,000 passengers were carried on steam railroads in 1927. This was approximately 23 per cent less than in 1917.[13]

Furthermore, the number of persons employed by railroads in 1927 was 1,784,639, which goes to show the importance of the rail-

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[11] *Accident Facts.* National Safety Council, 1927, Table II.

[12] Carrow, T. H. "Needless Waste of Human Life." *Transactions National Safety Council,* Vol. II, 1928, p. 769.

[13] *Railway Statistics of the United States of America.* Prepared by the Bureau of Railway News and Statistics, Chicago, 1927, 154 p.

road industry in the United States. During the same year, as a result of losses and damages to rolling stock and freight, the railroads paid out $42,241,948. In addition, the cost as a result of injuries to persons was $45,976,094. Since such a large number of people travel on railroads frequently, since railroads employ such a large number of wage earners, since the losses to accidents on the railroads must be borne sooner or later by the public, anything that can be done to reduce accidents concerns everyone.

Not only have the railroads been active in attempting to reduce accidents, but the national, state, municipal governments, and many private organizations have attempted through various agencies to make land transportation safer. Among these, the Interstate Commerce Commission has been doing outstanding work.[14] The work of the Bureau of Safety of the Commission has to do with the inspection of freight and passenger cars and locomotives, the testing and investigation of air brakes, inspection of hours of service of employees, investigation of signal and automatic train-stops and train-control devices, and many other safety appliances used on railroads.

The Steam Railroad Section and the Electric Railway Section of the National Safety Council[15] have also been making careful studies of the causes of railroad accidents. Accident prevention programs for railroads have been organized and safe practice pamphlets are issued as a result of the studies of these organizations.[16]

The Bureau of Standards at Washington and the American Standards Association have also been conspicuous in this work in setting up standards for safe materials and safe practice on railroads. It has been found in industry that when it is possible to set up standards or safety codes, that there is a general tendency toward the reduction of accidents. Of the 275 projects of the Standards Association, 10 have been directly concerned with railroad transportation.

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[14] *Report of Bureau of Safety.* Interstate Commerce Commission, Washington, D. C., 1928, 58 p.

[15] Electric Railway Section and Steam Railroad Section. *Transactions of the National Safety Congress*, 1927, Vol. I and II.

[16] See—Activities of the National Safety Council. Appendix.

MAKING TRANSPORTATION ON STEAM AND ELECTRIC RAILROADS SAFER

Community Civics and General Science

Objectives	*Materials and Activities*
To know what is being done by steam and electric railroads to reduce accidents.	The total number of accidents on steam railroads has been reduced 22 per cent since 1918. The reduction in number of persons killed has been 23 per cent, and the reduction in passengers killed 146 per cent. Electric lines have reduced the fatalities from 2,998 in 1911 to 1,991 in 1926.
To know some of the safety methods being used by railroads.	Methods being used. 1. Organization of safety program, analysis of accidents, education, competition and publicity. 2. Installation of safety devices including couplers, automatic signals, warning devices at crossings, automatic switches, etc. 3. Inspectional program by the Interstate Commerce Commission. 4. Improvement of railroad equipment, right of way, etc. 5. The elimination of grade crossings. 6. Keeping pedestrians off the right of way.
To recognize the hazards of railroad-highway grade crossings.	What precautions should be taken before grade crossings? Looking both ways before crossing. Slowing down for crossings and underpasses.
To know the dangers of trespassing on the railroad right of way and "hopping" trains.	The dangers of walking on railroads and playing on trains. 2,287 persons were killed on railroad property in 1928 (grade-crossing accidents not included).
To know what is being done by national, state and private agencies to safeguard land transportation.	The work of the Interstate Commerce Commission. What activities are carried on by the Commission? (See report of activities in appendix.)

Objectives	*Materials and Activities*
To know what is being done by national, state and private agencies to safeguard land transportation. (Continued.)	The work of the American Standards Association. Find out how standards or codes are made. What advantages would standard car couplers have? What other standards have been made? The work of insurance companies. Why are insurance companies interested in railroad safety? What kinds of insurance are written in connection with railroad transportation? Compare the relative safety of passengers on railroads with those on water and in air travel. The National Safety Council. Issues safe practice pamphlets on railroad safety. (See appendix.) Conducts campaigns and accident prevention contests. Makes studies of railroad accidents and safe practice. *References* *Accident Facts*, 1928, National Safety Council. *Transactions of the National Safety Congress*, 1927 and 1928. *Report of Bureau of Safety*, Interstate Commerce Commission, 1928.

SAFETY IN AVIATION

In spite of the remarkable increase in safety in the air, the public generally looks upon air travel as comparatively dangerous. Much of this is due to the attitude of the press toward aviation accidents and the newness of air travel. During the war the emphasis in aircraft design was placed upon speed, duration of flight, maneuverability, carrying capacity and ceiling, but since the war remarkable advance has been made in improving the safety of aircraft. More reliable airplanes are being built today with less danger of forced landings and accidents in the air. Aircraft engines are more reliable, instruments more accurate, and the fabrication

of the better machines is undoubtedly greatly improved over that in 1918. However, we cannot expect to see a truly air minded country until people are convinced that in air travel relatively great freedom from danger exists. Wright[17] found that the following were the most common causes of airplane accidents.

TABLE XXI

CAUSES OF AIRPLANE ACCIDENTS

Causes	Per Cent of Accidents
1. Errors of judgment on the part of the pilot	53
2. Forced landings away from a suitable landing field	20
3. Severe storms, lightning, fogs, ice formation, etc	19
4. Structural failures	8
Total	100

A study of the table above goes to show the most common causes of accidents. Although only 8 per cent of aircraft accidents are due to structural failures, it is here that perhaps the best safety work is being done.

According to the report of the United States Census Bureau there has been little change in the number of deaths as a result of aircraft accidents since 1920. The total number of deaths due to airplane and balloon accidents was 185 in 1920 and 180 in 1925. During the period, however, there has been a remarkable increase in the number of aircraft, in the number of flights, miles flown, and passengers carried. The United States Air Mail service records show an increase of 470 per cent in safety in the period of 1922-1925 as compared with 1918-1921. Similarly the French, British, and American Commercial Airlines[18] show a noteworthy improvement in safety.

In addition, the record of the United States Army Air Service[19] which showed one fatality to 73,631 miles in 1921 indicated that the fatalities in 1924 had decreased to one in 244,461 miles.

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[17] Wright, T. P. "Structural Analysis and Design in Relation to Commercial Aviation Safety." *Transactions of the National Safety Council,* Vol. 1, 1928, p. 394.

[18] *Accident Facts,* 1927. National Safety Council, p. 35.

[19] *Ibid.,* p. 35.

It is important that the factors that have been most influential in securing greater safety in aviation be located here. From an analysis of the following sources, the most important contributing factors have been established.

I. *Annual Report of the Director of Aeronautics.* Department of Commerce (1928. Pp. 46).

II. *Transactions of the Aircraft Sessions.* National Safety Council. 1928. Pp. 393-791.

III. *Civil Aeronautics in the United States.* Department of Commerce, 1928. Pp. 22.

The factors given below are not arranged in order of their relative importance and do not include all of the minor influences that may have been contributory but do indicate some of the important trends.

1. Improved work of the weather service and the communications of the Weather Bureau.
2. Establishment and improvement of landing fields all over the country.
3. Installation of light beacons, intermediate field lighting, improvement in floodlights and other aids to navigation.
4. Improvement in standards required for licensing pilots.
5. Improvement in structural design of aircraft and the reliability of motors.
6. Increased reliability of aircraft instruments and accessories.
7. Inspection of aircraft by the Department of Commerce (elimination of old worn out airplanes).
8. Improvement in methods of training flying and ground personnel.
9. The development of the aircraft parachute.
10. Establishment of aviation schools, research and aircraft standards.
11. Improved methods of fire prevention.
12. A strong demand on the part of the public for safety in aviation.

Table XXII indicates the comparative statistics of commercial and private aviation in United States and Europe in 1926.

TABLE XXII

AIR TRANSPORT AND AIR SERVICE IN 1926*

	Item	United States	Europe
	Air Transport		
1.	Airplane miles flown	4,428,772	8,852,552
2.	Passengers carried	5,782	102,178
3.	Express and freight carried (pounds)	1,733,090	9,880,115
4.	Mail carried (pounds)	810,855	2,853,550
5.	Miles of airways	8,525	31,137
6.	Miles of lighted airways	3,149	0
7.	Number of Routes	16	100
8.	Average passenger rate per mile	$0.12	$0.08
	Air Service		
9.	Airplane miles flown	8,746,640	†
10.	Passengers carried	771,010	†
11.	Express and freight carried	418,986	†

* Report of Department of Commerce, 1928.

† No equivalent for Europe.

It will be evident from this table that air travel is becoming more important each year. The fact that in 1926 776,792 passengers were carried by air service and air transport airplanes a total of 13,175,412 airplane miles is highly significant. In the same year according to the United States Census, 170 persons were killed in airplanes and balloons which would indicate that there was one fatality—pilot or passenger—for 76,914 miles. This included all kinds of air travel. An examination of the records of the airways operations of the Aeronautics Division of the Department of Commerce, where only licensed pilots would be in charge of aircraft,[20] showed distinct improvements in the safety of air travel. This is shown in Figure 6.

It is apparent that aviation as a means of transportation and communication is becoming more important every year. New air mail routes and air transport routes are being established and there is a constantly increasing desire to make use of air travel. It is also evident that air safety on regular supervised air transport lines and

[20] *Op. cit. Accident Facts*, 1927.

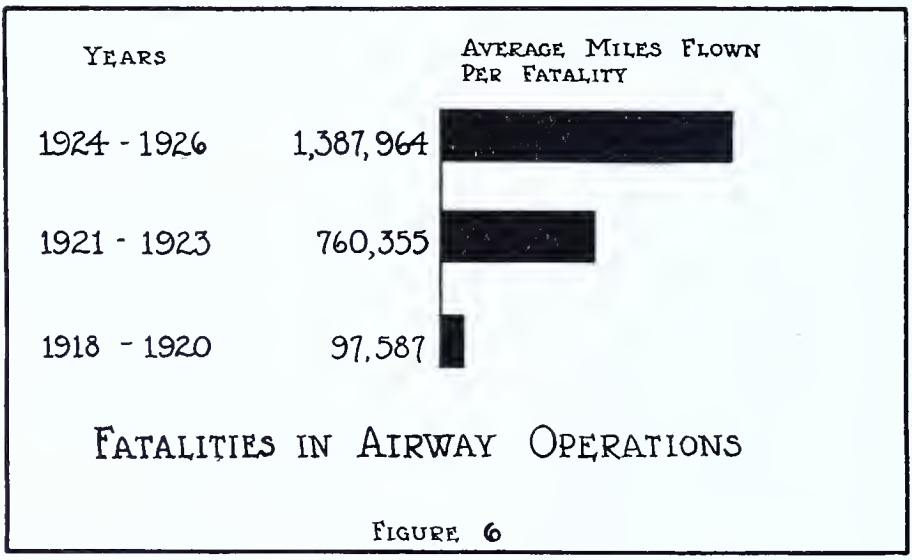

Figure 6

army air service is much greater than that in other kinds of aviation where aircraft are not as carefully inspected and pilots are not as well trained. Where the aviation service is under the supervision of the Aeronautics Division and all provisions for safeguarding air travel are taken care of, the relative number of accidents resulting in a loss of life has shown a decrease.[21] Although air travel has not become as safe as transportation by railroads and water, nevertheless there has been a remarkable improvement in the last ten years.

SAFETY IN AVIATION

General Science—Physics

Objectives	*Materials and Activities*
To know of the relative importance of different causes of aviation accidents.	The common causes of aviation accidents. Errors in judgment on the part of pilots. Forced landings away from suitable landing fields. Storms, lightning, fogs, ice-formation, etc. Structural failures of wings, fuselage and motors.

[21] Fatalities in 1929 have shown a surprising increase. Complete data for the year will not be available until 1930.

Objectives	*Materials and Activities*
To know of the increase in air transportation and the growth of the aviation industry.	The place of aircraft in warfare. Evidences of the growth of aviation. A. The development of mail service. B. The growth of the transport service. C. The increase in the number of miles flown by aircraft. D. The comparative development of aviation in European countries. (See Table XXII.)
To appreciate the increased safety of aviation and know some of the factors which have been contributory to this improvement.	Evidence to indicate increased safety in the air. Improvements that have been made to safety in lighter than air craft. Work that is being done to reduce aviation accidents and facilitate commerce. A. The work of the U. S. Weather Bureau and local meteorological stations in giving weather information. B. The value of municipal and federal landing fields. C. The work of the Department of Commerce in installing beacons, floodlights and other aids to navigation. D. Improving student training and the licensing of pilots. E. Improving the structural design of air craft. F. The value of more reliable aircraft instruments such as compasses, bank indicators, rate of climb indicators, etc. G. The development of aircraft parachutes. H. Aviation research and aviation schools in the United States. I. Protection of aircraft and hangars from fire. J. The demand on the part of the public for greater safety in aviation. K. The work of the Daniel Guggenheim Fund for the Promotion of Aeronautics. M. The use of wing slots in airplanes.

Source Materials

1. *Civil Aeronautics in the United States*, 1928. Dept. of Commerce.
2. *Air Transport in the United States*, New York: Aeronautical Chamber of Commerce.
3. *Transactions of the National Safety Council*, Aircraft Session, 1928.
4. *Aeronautic Safety Code*, New York: Society of Automotive Engineers.
5. *Annual Report of Director of Aeronautics*, 1928, Dept. of Commerce.
6. *Bibliography of Books and Articles on Aeronautics*, New York: National Bureau of Casualty and Surety Underwriters.
7. Motion pictures and slides on aviation are available at the office of the Chief of Air Service, Washington, D. C.

PREVENTION OF ACCIDENTS IN WATER TRANSPORTATION

For many years water transportation has been one of the common methods of travel. According to the records of the Department of Commerce,[22] in 1927 there were 230,874,917 passengers carried on steam vessels that were required by law to report the number of passengers carried. This does not include ferry transportation on rivers or lakes, but includes all steam vessels navigating in American waters, foreign steam vessels which embark passengers at American ports, and certain types of motor vessels, sailing vessels, and tugs. During the same year the lives of 81 passengers were lost as a result of accidents or founderings. This would indicate that 2,850,307 passengers were carried for each passenger lost. At the same time the lives of 194 members of crews of passenger or non-passenger vessels were lost. Of the total number of lives lost a large number were due to suicides, accidental drowning, and other causes not chargeable to defects in the transportation service.

During 1927 the number of lives saved by means of life-saving appliances required by law was 419. These appliances include life rafts, life preservers, and life boats.

Many agencies have contributed toward safety in water transportation. Foremost among these have been the improvements in the construction of the vessels and the installation of more accurate navigation instruments and wireless telegraphy. The Weather Bureau has been unusually active in the issuing of storm warnings and the "maintenance and operation of marine intelligence for the benefit of commerce and navigation."[23] There are now 125 broadcasting stations cooperating with the Weather Bureau and storm warnings are displayed at more than 400 points along the coast.[24]

The Steamboat Inspection Service[25] has also been active in safeguarding water transportation. This service inspects vessels, boilers, marine boiler plates, and life-saving devices. It issues licenses to pilots and seamen and prevents overloading of passenger

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[22] *Annual Report of Steamboat Inspection Service.* Washington: Department of Commerce, 1928, p. 15.

[23] *The United States Weather Bureau.* Department of Agriculture.

[24] See Appendix B. Activities of the Weather Bureau.

[25] *Op. cit.* See Appendix B. Activities of Steamboat Inspection Service.

vessels and is generally responsible for the setting up of the requirements for steamships to be used in passenger or freight service.

The Lighthouse Service has made an important contribution to water transportation safety. This service is charged with the establishment and maintenance of aids to navigation on the coast of the United States and in inland waters.[26] This includes a wide variety of activities such as the work of light stations, light vessels, fog signals, buoys, minor lights, day beacons, radio fog signals, submarine fog signals, river lighting, helping vessels or persons in distress, and many other activities.[27]

The United States Coast Guard is also active in safeguarding water transportation.[28] In 1927 several thousand persons were rescued from peril, 1,788 vessels were seized or reported for violation of the law, 136 derelicts or other obstructions to navigation were destroyed, many vessels in distress were assisted, and the loss of much valuable property was prevented. It has had charge of the ice patrol work that has been done on the Grand Banks of Newfoundland to protect navigation. During recent years much of the work of the Coast Guard has been directed toward the enforcement of customs laws and the prevention of the smuggling of liquor. In addition much valuable assistance has been given in recent years in flood and hurricane service.[29]

All of these activities have been of some value in reducing the dangers of water transportation. One may have little fear in taking ocean or lake voyages at the present time. As is the case in railroad transportation everything is being done to protect the traveller. It is quite important that pupils learn of these safeguards so that they may better appreciate what is being done for them.

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[26] Department of Commerce. *The United States Lighthouse Service*, 1923.

[27] For activities of The Lighthouse Service see Appendix B.

[28] Treasury Department, *Annual Report of the United States Coast Guard*, 1927. (See Appendix.)

[29] *Ibid.*, p. 8.

THE PREVENTION OF ACCIDENTS IN WATER TRANSPORTATION

General Science—Community Civics

Objectives	*Materials and Activities*
To know of the importance of water transportation.	230,874,917 passengers were carried on vessels in 1927. (Excluding ferries and certain other private vessels.) 2,850,307 passengers carried for each passenger lost.
To know of the methods used in safeguarding water transportation.	Improvements in the construction of vessels. More accurate navigation instruments. The value of wireless telegraphy and telephony. Safe devices on ships: life rafts, life boats, life preservers.
To know what federal agencies have been doing to safeguard water transportation.	The United States Weather Bureau. Gives storm warnings by radio. Displays storm warnings at 400 coast stations. The Steamboat Inspection Service. Inspects vessels, boilers, life-saving devices. Issues licenses to pilots and seamen. Prevents overloading of vessels. The Lighthouse Service. Has light stations, light vessels, fog signals, buoys, minor lights, radio and river lighting. The United States Coast Guard. The work in enforcing customs regulations. Assisting of vessels in distress. Destroying the derelicts and other obstructions. The work of the Coast Guard in flood relief. The work of the Ice Patrol. The work of the stations on the coast. How submarines are being made safer.
To learn what is done in case of accident on board ship.	Locate life preservers. Go to place at life boat or raft.

Objectives	*Materials and Activities*
To learn what is done in case of accident on board ship. (Continued.)	How fires on board ship are extinguished. Recent disasters at sea—how they might have been prevented. *Selected References* *The United States Weather Bureau*, Department of Agriculture. *The United States Lighthouse Service*, Department of Commerce. *Report of the Steamboat Inspection Service*, Department of Commerce. *Annual Report of the Coast Guard*, Department of Treasury. *Report of Steamboat Inspection Service*, Department of Commerce.

CHAPTER VII

THE NATURE AND TREATMENT OF COMMON INJURIES

There is every reason to believe from the studies of accidents and injuries that have been made in this and preceding chapters that there is a need in the schools for well organized instruction in first aid. Minor accidents requiring first aid treatment are very common. Major accidents, necessitating the loss of one school day, are much less common, but the study reported by Elson[1] in Safety Education Magazine showed that, on a basis of 1462 lost time accidents to school children for an average enrollment of 52,223 in a six months period, major accidents are more significant than would have been expected. Following major or minor accidents comes the need of first aid treatment. In many cases this will require the attention of a physician or nurse, but the most important thing in case of accident is to know what to do and how to do it quickly. This requires a knowledge of the best methods of first aid.

There is some evidence to show what is being done in secondary schools to provide this kind of instruction. The analysis of textbooks in Chapter IX shows that materials for first aid instruction are found in a variety of school subjects including biology, general science, health, and chemistry. In some schools this instruction is being given by the physical director or school nurse. In others there is some training given through extra-curricular activities—First Aid, Life Saving, Boy Scout, and similar clubs. The American Red Cross has been influential in improving the quality and the interest in the schools in which it has been able to organize work. Moreover, the work of the Boy Scouts, Girl Scouts, Campfire Girls and other similar organizations, closely allied to the schools, has been unusually good but at best reaches only a small percentage of the school population.

What are the needs of first aid instruction? It is necessary here to make a study of the kinds of injuries that require treatment and to organize the instruction around these needs. In order to determine the most common injuries data from four sources have been studied.

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[1] *Op. cit.* *Safety Education Magazine*, February, 1929.

1. The nature of injuries received in the St. Louis Public Schools in the school year 1925-1926.
2. The nature of injuries in Boy Scout summer camps in the New England area.
3. Industrial accidents in 1920 and 1924 as compiled by the United States Department of Labor.
4. The report of New York ambulance calls for 1927 as given by the Board of Ambulance Service.

These data therefore include the injuries received in schools, homes, industries, transportation, and public places and in general provide a good indication of the kinds of first aid treatment that might be required.

During the year 1925-1926 the school authorities in St. Louis kept accurate records of the major injuries in elementary and secondary schools. These included injuries received within the school and on the school grounds. It was found that the per cent of accidents of high school pupils based on the enrollment was 1.3 while that in the elementary schools was .6. This does not include the minor injuries but in all probability presents an average picture of the kinds of injuries that occur in high schools and elementary schools. The distribution of these injuries is shown in Table XXIII.

TABLE XXIII

NATURE OF INJURIES, ST. LOUIS PUBLIC SCHOOLS, 1925-1926*

Kind of Injury	Number of Cases	
	High Schools	Elementary Schools
Wounds, (Cuts, lacerations)	44	128
Bruises, swellings, contusions	27	123
Wrenches, sprains, strains	34	61
Abrasions	8	32
Fractures	7	24
Dislocations	3	9
Broken bones	2	3
Burns	12	0
Bleeding nose, profuse hemorrhage	1	9
Internal injuries	2	0
Broken teeth	0	11
Injuries to eyeball	0	4
Crushed fingers	0	4
Injuries not classified	14	0
Total injuries	154	408
Enrollment	11,305	69,401
Per cent accidents based on enrollment	1.3	0.6

* Public School Messenger, St. Louis, 1927, p. 95.

Another source of statistics on injuries was found in the report of the camping department of the Boy Scouts of America. These data were secured by the director of first aid and life saving from the reports of directors of Boy Scouts' camps in the New England area. There is no evidence to show how carefully camp records are kept, but for the purposes for which the data are being used they are sufficiently accurate. Here again there is question of what constitutes a reportable injury. Evidently the accidents reported are only those which came to the attention of the camp physician or the director and do not represent all of the first aid needs of the campers. It would naturally be expected that many minor injuries might occur at the waterfront, on the hike, or away from the camp grounds and not be reported. For purposes of comparison, the frequencies of different kinds of sickness are included with the accidents in Table XXIV. It will be noted that the total number of cases requiring first aid treatment as a result of accidents was nearly six times the number of cases of sickness.

TABLE XXIV

ACCIDENTS AND SICKNESS IN BOY SCOUT CAMPS—NEW ENGLAND AREA*

Kind	Number Cases	Camps Reporting
Accidents:		
Cuts, abrasions, and scratches	1,484	20
Sunburn and other burns	169	11
Poison ivy and poison oak	83	9
Fractures	5	3
Sprains	4	1
Bruises	1	2
Blisters	1	1
Insect bites	1	1
Total accidents	1,749	
Sickness:		
Sore throat	177	14
Fever	41	7
Pink eye	28	2
Earaches	23	5
Boils	5	1
Stomach ache	11	2
Other diseases	20	
Total sickness	305	
Total cases requiring attention	2,054	

* The number of boy-weeks in camp was 25,000. This is equivalent to 6,250 boys in camp for four weeks or 3,125 boys in camp for eight weeks.

This record of injuries in summer camps shows that accidents may play an important part in the life of the camper. It should be pointed out that, so far as the Boy Scouts are concerned, the first aid requirements for first class scouts take care of the needs of this particular group of adolescents.

Some idea of the nature of injuries received in industrial accidents may be obtained from the records of the Bureau of Labor Statistics.[2] This study gives the distribution of 769,630 injuries received in 1920 and 1924. It was compiled by the Bureau of Labor from the reports of twelve states in 1920 and nine states in 1925. The sampling of the states is large enough to indicate the ranking of different types of injuries in industries for the country as a whole.

TABLE XXV

INDUSTRIAL ACCIDENTS, CLASSIFIED BY NATURE OF INJURY, 1920 AND 1924*

Nature of Injury	Number of Cases		
	1920 12 States	1924 9 States	Total
Bruises, contusions	141,694	100,403	242,097
Cuts, lacerations and punctures	133,958	94,244	228,202
Sprains and dislocations	61,968	40,209	102,177
Fractures	42,045	39,918	81,963
Burns	26,006	14,456	40,462
Amputations	8,338	5,967	14,305
Asphyxiations	318	127	445
Unclassified	38,597	21,387	59,984
Total	452,919	316,711	769,630

* As reported by the U. S. Bureau of Labor in 1927.

It is difficult to secure an adequate sampling of major non-fatal home and public injuries. Insurance company records cover policyholders only and would not necessarily give a valid sampling of the total population. Hospital records would have a certain value but would not include the minor injuries.

The best source of data that was available was the record of ambulance calls in New York City. Although this record includes the more serious injuries only, and does not take into consideration

[2] Chaney, Lucian W. *Record of Industrial Accidents in the United States to 1925.* United States Department of Labor, 1927, p. 35.

the many thousands of injuries treated by private physicians, nurses, teachers, and physical directors, nevertheless, for the purposes for which it is to be used, it provides useful information. Of the total number of 155,200 ambulance calls in 1927, 70,681 calls were for accidents, while 76,877 calls were for diseases. Lacerations and contusions make up over 50 per cent of the total number of injuries. Fractures and sprains total 16 per cent of the cases. Table XXVI gives the distribution of the injuries according to a common classification.

TABLE XXVI

GREATER NEW YORK AMBULANCE CALLS FOR 1927 CLASSIFIED AS TO INJURIES AND ACCIDENTS*

Kind of Injury	Number
Laceration	21,556
Contusions	16,570
Fracture (lower extremity)	3,860
Fracture (upper extremity)	3,299
Fracture (skull)	2,394
Sprains	2,308
Gas poisoning	1,838
Poisoning (miscellaneous)	1,876
Burns and scalds	1,468
Concussion (cerebral)	1,346
Dog bite	1,056
Shock	1,034
Dislocation (upper extremity)	963
Abdominal injuries	838
Hernia	774
Stab wounds	614
Bullet wounds	552
Dislocations (lower extremity)	427
Incised wounds	415
Heat prostration	356
Asphyxiation	179
Electrical burns	96
Unclassified	6,862
Total	70,681

* *Report of Board of Ambulance Service.* New York, 1927.

The four tables that have been selected to indicate the nature of injuries are from widely differing sources and unfortunately are not comparable as far as the extent of sampling is concerned. In addition, minor injuries requiring first aid enter only slightly into these data. In many cases these are very important. Infections

from such injuries, not properly treated, are often serious. Sunburn and poison ivy, for example, may lead to serious illness and may spoil a boy or girl's stay in camp. At the same time the injuries reported do not include many of the forms of reaction attendant upon accidents such as shock, hysteria, prostration, and fainting. Treatment for these reactions should be included in the first aid curriculum. In order to secure a rough ranking of these different injuries on a basis of their relative frequency, the six most common kinds of injuries have been ranked in Table XXVII.

TABLE XXVII

RANK OF COMMON INJURIES BY FREQUENCY OF OCCURRENCE

Kind of Injury	Source of Data				
	School	Industrial	Ambulance Call	Camp	Average
Wounds (cuts, lacerations, abrasions)	1	2	1	1	1.25
Bruises, swellings, contusions	2	1	2	5	2.50
Wrenches, sprains, strains, dislocations	3	3	4	4	3.50
Fractures, broken ribs	4	4	3	3	3.50
Burns (including sunburn)	5	5	5	2	4.25
Profuse bleeding	6	6	6	..	6.00

In addition to the kinds of injuries common to various life activities, it was found that the following have an important place in first aid needs:

1. Asphyxiation and suffocation from gas or drowning.
2. Poisons (internal and external).
3. Bites of animals (dogs, poisonous snakes, etc.).
4. Shock or fainting.
5. Heat prostration and sunstroke.
6. Freezing or frostbite.

The following conclusions are suggested from these tables:

1. The ranking of common injuries by frequency of occurrence is much the same for industrial, home, and school accidents.

2. Certain situations such as those of summer camps or in homes give rise to peculiar types of injuries. While these injuries may not be common to all life activities, nevertheless, some of these are so frequent as to suggest that first aid treatment be included in the curriculum. Examples of these are sunburn, poison ivy, internal poisons, drowning, shock or fainting, and freezing or frostbite.

From the preceding tables the following objectives for first aid have been organized:

1. To know how to treat cuts, lacerations, abrasions, scratches, and punctures.
2. To know how to treat bruises, swellings, and contusions.
3. To know how to administer first aid for wrenches, sprains, and dislocations.
4. To know what to do for patients suffering from fractures or broken bones.
5. To know the best first aid treatment for sunburn and other burns and scalds.
6. To know how to check bleeding from various parts of the body.
7. To know how to treat shock or fainting.
8. To know how to treat persons suffering from gas poisoning, electrical shock, or drowning.
9. To know what to do for various poisons (external and internal).
10. To know how to treat alkali and acid burns.
11. To know what to do for bites of dogs or poisonous snakes.
12. To know how to treat sunstroke and heat prostation.
13. To know what to do for frozen or frost bitten parts of the body.
14. To know how to take care of some of the common aftermaths of accidents—hysteria, unconsciousness, etc.
15. To know some of the common lifts and carries to use in moving patients.
16. To know some of the common uses of bandages.
17. To know what to select for a home or school first aid kit.

OBJECTIVES AND MATERIALS IN FIRST AID

In order to suggest the most reliable first aid materials and methods and to show the comparative value of certain secondary school textbooks and source books, the folllowing method has been used. A study has been made of nine textbooks and manuals to determine the first aid content and particularly the suggestions for treating injuries. It was assumed that, whenever it was possible to secure common agreement among medical and first aid authorities, this agreement would represent the most desirable practice. It is a well recognized fact that the experiences of hundreds of experts have gone into the creation and revision of the Red Cross, Boy Scout, Johnson and Johnson, and similar first aid manuals. This analysis does not show the total amount of instructional materials in first aid in the several sources nor does it suggest the extent in which the treatment for different injuries was discussed. The books analyzed were typical examples of sources that were being used in secondary schools. It should be stated that only five of these—R, T, B.S., P, and J—are specifically first aid books. The others—B, D, M, and W—consider first aid only in one or more chapters and obviously might not be expected to be as complete.

TEXTBOOKS AND SOURCE BOOKS ANALYZED

Author	Title	Publishers	Code	Date
Lynch	*First Aid*	American Red Cross	R	1925
Burkard, Chambers, Maroney	*Health Habits*	Lyons & Carnahan	B	1925
Davidson	*Human Body & Health*	American Book Co.	D	1924
Marsh	*Home Nursing*	P. Blakeston	M	1920
Travelers Insurance Co.	*First Aid to the Injured*	Travelers Insurance Co.	T	1927
Boy Scouts of Amer.	*Handbook for Boys*	Boy Scouts of Amer.	BS	1924
Johnson & Johnson	*First Aid Manual*	Johnson & Johnson	J	1918
Williams, J. F.	*Healthful Living*	Macmillan	W	1927
United States Public Health Service	*What to do in Case of Accident*	Treasury Department	P	1928

A wide variation was found in the content of the nine sources examined. In the first place the range in number of items suggesting treatment for injuries was from 20 to 104 with a mean of 60.4

and an average of 3 items for each topic. In the same way there was a wide variation in the number of pages devoted to first aid ranging from 12 to 229 with an average of 55. One of the sources suggested no treatment for 11 of the 20 topics. Two others left out 9 and 10 of the topics. Sources R, P, B.S., and J were most complete and covered all of the subjects that might be included in a minimum course in first aid. With the exception of M the remaining sources do not provide an adequate treatment of the subject and should be supplemented by one or more of the more complete books. Table XXVIII shows the summary of the number of items in the nine books analyzed.

TABLE XXVIII

NUMBER OF ITEMS IN NINE BOOKS SPECIFYING TREATMENT FOR INJURIES

Kind of Injury	Number of items by books*									
	R	B†	D†	M	T	BS	J	W†	P	Total
Cuts and wounds	8	2	2	2	5	8	7	4	5	43
Contusions, bruises	4	0	1	1	1	2	3	1	4	17
Fractures, dislocations	8	0	0	4	5	5	3	3	3	31
Sprains, strains	5	0	3	4	3	4	4	3	3	29
Burns and scalds	5	2	3	3	3	3	5	4	2	30
Acid and alkali burns	3	0	4	2	3	3	4	0	2	21
Bleeding from special part	10	2	4	4	8	10	9	4	7	58
Bleeding from the nose	4	0	2	4	0	3	3	0	3	19
Internal poisons‡	5	5	3	5	1	2	4	3	6	34
Poison ivy or oak	2	1	2	2	0	2	0	0	2	11
Fainting	7	3	6	4	0	7	4	4	6	41
Shock	5	0	2	5	3	5	5	0	5	30
Frost bite, freezing	3	0	2	3	0	3	3	0	3	17
Artificial respiration	6	3	3	3	3	6	5	2	6	39
Insect bites	3	0	2	1	0	3	2	0	2	13
Heat prostration	3	0	1	2	0	3	3	0	0	12
Sunstroke	3	0	2	2	0	3	2	0	3	15
Bites of animals	10	0	5	7	0	10	4	0	8	44
Bandaging	4	2	0	4	4	4	4	3	4	29
Lifts and carries	6	0	0	4	0	5	0	0	0	11
Total	104	20	47	66	37	90	74	31	74	548
Total pages on first aid	207	13	12	36	22	30	96	11	68	

* For names of books see code above.

† First aid in these books considered only incidental to larger problems of health.

‡ Does not include tables of antidotes.

Having determined the most common kinds of injuries in every day life and the methods of treatment as suggested in nine books, the next step was to construct a curriculum in first aid. This curriculum is to be considered only an outline of minimum materials and activities. No attempt has been made to give methods of teaching. However, it is suggested that this outline could be used as the basis for organizing first aid instruction.

In the outline that follows the number in parenthesis indicates the number of times this item appeared in the several books analyzed. Ordinarily, treatments suggested in only one or two books would not be as reliable as those found in all. This principle does not always hold true. In some cases highly valuable first aid treatments are found in only one or two sources largely because first aid manuals tend to lag some time behind the new discoveries in medicine and science.

FIRST AID

Physical Education, Health, Home Nursing

Objectives	*Materials and Activities*
	In all serious cases call the doctor at once.
To know how to treat cuts, lacerations, abrasions, scratches and punctures.	Stop the bleeding. (7) Cleanse with warm water and antiseptic soap. (2) Apply tincture of iodine. (7) When there is grease or other foreign substance, cleanse wound with gasoline or benzine. (3) Lay several thicknesses of sterile gauze over wound, cover with cotton and bandage. (8) Apply turpentine or 5 per cent carbolic acid. (1) Do not use non-antiseptic cloth on wounds. (5) In punctured wounds increase bleeding by squeezing. (2) See that your hands are clean. (4)
To know how to treat bruises, swellings and contusions.	Applications of cold water. (8) Use arnica or witch hazel. (3) Use hot water for severe bruises. (3) In severe cases involving shock treat as in shock. (3)

Objectives	*Materials and Activities*
To know how to administer first aid for wrenches, sprains and strains.	Sprains. (7) Apply heat or cold. (7) Absolute rest for injured part. (6) Bandage the joint. (4) Strains. (7) Rest for injured part. (7) Rub in alcohol and water. (2) Rub in arnica or witch hazel. (2)
To know what to do for patients suffering from fractures, dislocations or broken bones.	Place patient in a comfortable position. (7) Treat bleeding and dress wounds with sterile gauze. (7) Apply splints if doctor does not come. (7) Use triangular bandages to hold splints in place. (4) Never try to move person any distance until fracture is supported by splints or bandages. (4) Do not attempt to reduce dislocations except those of the lower jaw. (3) Treat for shock if necessary. (3) Special treatment for different kinds of fractures. (5)
To know the best aid treatment for sunburn and other burns and scalds.	Ordinary burns. (9) Apply ordinary or carbolized vaseline. (8) Apply lime water, baking soda or olive oil. (4) Use fresh lard or cream. (4) Deep burns. (4) Use picric acid gauze. (4) Solution of epsom salts. (2) Use carron oil. (3) Acid and alkali burns. (7) Wash with quantities of cold water. (7) Neutralize acid burn with limewater or sodium bicarbonate. (5) Neutralize alkali burn with acetic, boric acid or vinegar. (3) Treat severe burns as above. (6)
To know how to check bleeding from various parts of the body.	Arterial bleeding. (9) Cover thumb with several thicknesses of gauze and press directly on the wound. (7) Apply tourniquet above the wound. (9) Loosen tourniquet every 30 minutes to allow circulation. (5)

Objectives	*Materials and Activities*
To know how to check bleeding from various parts of the body. (Continued.)	Cover with antiseptic cloth. (4) Apply pressure at certain points for reducing bleeding. (4) Bleeding from veins. (9) Lay a pad of gauze on the wound and bind with a moderately firm bandage. (7) In severe cases have patient lie down and apply compress below the bleeding point. (9) Keep patient warm. (5) When bleeding ceases administer hot drinks. (3) Cold water or ice checks bleeding. (4) Nosebleed. (6) Broken ice or cold water applied to back of neck. (6) Patient should lean backward and not forward. (5) Place a roll of paper between gum and upper lip. (5) Snuff salt and water up nostrils. (3)
To know how to treat shock or fainting.	Shock. (7) Lay patient flat on his back. (7) Stimulate circulation by rubbing. (3) Keep patient warm with coverings, hot water bottle, etc. (6) Give aromatic spirits of ammonia. (5) Give hot tea or coffee. (6) Remove clothing that might interfere with circulation. (3) Fainting. (8) Lay patient on his back. (8) If indoors open windows. (7) Sprinkle cold water on face. (8) When conscious give sips of hot milk or water. (4) Loosen all tight clothing. (7) Do not move person for some time. (4) Use smelling salts or aromatic spirits of ammonia. (4)
To know how to treat persons suffering from gas poisoning, electrical shock or drowning.	Artificial respiration. (8) Use the prone pressure method. (8) Do not give up until patient is fully conscious. (7) If patient does not recover, do not give up for several hours. (6)

Objectives	*Materials and Activities*
To know how to treat persons suffering from gas poisoning, electrical shock or drowning. (Continued.)	Ammonia or coffee may be given to persons who show signs of returning to consciousness. (3) Keep patient warm. (8) Always transport a resuscitated person in a prone position. (3) (For explanation of the prone pressure method see Red Cross Manual. For Sylvester method see Johnson and Johnson Manual.)
To know what to do for various poisons, external and internal.	Internal poisons. (8) Administer an emetic such as mustard and water, salt and water or lukewarm water. (8) Ipecac may be used as an emetic. (4) Do not give emetics for acids but use chalk or soda. (6) If poison is unknown it is safe to use milk, raw eggs, olive oil or sweet oil. (4) Use epsom salts for carbolic acid. (7) For alkalis use vinegar or lemon juice. (5) External poisons: poison ivy or oak. (3) Wash skin with soap and water. (2) Use lead water or boric acid. (3) Permanganate of potash. (1) Weak ammonia. (1) Saturated solution of epsom salts. (2)
To know what to do for bites of poisonous snakes or dog bites.	Snakes. (6) Apply tourniquet. (6) Open up and suck wound—stimulate bleeding. (6) Apply permanganate of potash to wound. (5) Administer aromatic spirits internally. (3) Apply iodine. (1) Cauterize the wound. (4) Dog and cat bites. (2) Squeeze wound between fingers. (2) Apply tourniquet. (2) Apply hot water. (2) Cauterize with hot water or nitric acid. (2)

Objectives	*Materials and Activities*
To know how to treat sunstroke or heat prostration.	Sunstroke. (6) Keep patient cool by wrapping in sheets wrung out of cold water. (6) Apply chopped ice wrapped in cloth to the head. (6) Put patient in a cold bath. (3) Heat prostration. (4) Loosen patient's clothing. (3) Give cold water to sip. (3) Bathe face with warm water. (1) Give hot coffee or tea. (4) A hot bath may be given. (1)
To know what to do for frost bite or freezing.	Rub with snow or cold water. (6) Gradually raise temperature of the water. (6) Give a stimulant—tea, coffee, ammonia. (4) Apply vinegar and water after circulation has been restored. (1)
To know some of the common uses of bandages.	How to use a roller bandage. (8) The use of the triangular bandage. (8) How to make arm and leg slings. (7) How to make a four tailed bandage. (6)
To know some of the common lifts and carries.	How to make a stretcher. (2) How to lift a patient from a prone position. (2) How to use the different carries. (2) How to select and prepare a bed for a patient. (2) How to make a patient comfortable in bed. (2)
To know what to select for a home or school first aid kit.	Check the list of contents against the equipment suggested by the American Red Cross. All of the references analyzed in this study have some value but the best references for supplementary use will include 1. American Red Cross, *First Aid Manual.* 2. United States Public Health Service Manual. 3. Johnson and Johnson, *First Aid Manual.* 4. Boy Scouts of America, *Handbook for Boys.* 5. American Red Cross, *Instruction Manual for First Aid.*

CHAPTER VIII

SAFETY ACTIVITIES IN SECONDARY SCHOOLS

There are many curricular and extra-curricular activities in secondary schools which do not appear in courses of study. These activities may have an important contribution to safety education. The safety patrol, for example, has been adopted by a large number of junior high schools and a few senior high schools as a definite attempt to protect pupils at dangerous crossings near schools. The teaching of swimming as a part of the secondary school program has been an important contribution to safety in the water. As was shown in Chapter III, even though there has been a noteworthy increase in the amount of bathing at inland and ocean bathing places during the last ten years, the number of drowning accidents has actually decreased, partly as a result of the precautionary measures that are taken to prevent accidents and partly because more people are learning to swim.

In order to find out what is being done in some of the representative secondary schools in the country a questionnaire was used. This first involved making a study of three secondary schools in order to determine the most significant safety activities. A questionnaire was then made out and sent to one hundred secondary schools in various sections of the United States. The schools selected were taken from the list represented in the National Association of Secondary School Principals. Replies to questionnaires were received from 58 schools in 21 states. The size of the school ranged from 214 to 2600 for junior high schools, with a mean of 1,241, and from 564 to 4,513 for senior high schools, with a mean of 1,417, so that the survey would give only a fair picture of current practice in some of the larger high schools.

There were two purposes of this study:

First: To find out the practice in safety education in certain junior and senior high schools in the United States.

Second: To suggest activities in which certain curriculum materials, which have been validated earlier in this study, might be placed.

The first section of the study dealt with fire prevention activities, the second with accident prevention, and the third with safety

in physical education and health activities. The questionnaire used will be found in the appendix.

Fire prevention activities had an outstanding place among the safety activities of the schools. The state requirements for fire prevention and the activities of local and state fire prevention organizations in all probability have had much to do with this. Many communities feel that one of the best ways to reduce fire hazards and fire losses is through education. It was found that 94 per cent of the 58 schools reported monthly or bi-monthly fire drills. The schools of St. Louis rather than having regular monthly drills utilize the dismissals as fire drills. The average time required for getting pupils out of buildings was 1 minute 45 seconds for junior high schools and 2 minutes 7 seconds for senior high schools. Fire extinguishers are used for protection in 93 per cent of the buildings while 17 per cent have fire hose and 9 per cent use sprinkler systems. In the assembly programs fire prevention was given a place at least once a year in 74 per cent of the schools. These programs included playlets, talks by fire chiefs or firemen, motion pictures, discussions and pupil centered programs of various kinds. In 62 per cent of the schools represented, home room programs emphasizing fire prevention were given at certain times during the year and 38 per cent cooperated with local fire departments or other local organizations in home inspection campaigns. No attempt has been made by the investigator to evaluate these activities. A more complete analysis is shown in Table XXIX.

TABLE XXIX

SUMMARY OF FIRE PREVENTION PROVISIONS AND ACTIVITIES IN SECONDARY SCHOOLS

Activities	Junior High		Senior High		All Secondary	
	No. Having	Per Cent	No. Having	Per Cent	No. Having	Per Cent
Regular fire drills	27	96.5	28	93.3	55	94.8
Fire prevention assemblies	19	67.8	24	80.0	43	74.2
Home room fire prevention programs	20	71.4	16	53.3	36	62.0
Home inspection blank	9	32.2	13	43.3	22	38.0
Motion pictures on fire prevention	7	25.0	6	20.0	13	22.4
Using fire extinguishers	24	85.7	28	93.3	52	89.6
Using fire hose	6	21.4	4	13.3	10	17.3
Having a sprinkler system	1	3.5	4	13.3	5	8.6
Total number of schools	28	100.0	30	100.0	58	100.0

It is evident that considerable stress is being placed on accident prevention in and about school buildings. Of the junior high schools 53 per cent reported safety patrols and 50 per cent have safety councils, while 20 per cent of the senior schools reported patrols and 17 per cent have councils. In addition, 74 per cent of the schools have some kind of traffic control within the building or on playgrounds, 55 per cent have safety assemblies at least once a year, 59 per cent report home room programs, 14 per cent use films or slides on safety, and 67 per cent utilize posters or literature on safety such as issued by the American Red Cross, the National Safety Council, local safety councils, and similar organizations. The extent of these activities is shown in Table XXX.

TABLE XXX

SUMMARY OF ACCIDENT PREVENTION ACTIVITIES OF SECONDARY SCHOOLS

Activities	Junior High		Senior High		Total	
	No. Having	Per Cent Having	No. Having	Per Cent Having	No. Having	Per Cent Having
Safety patrols	15	53.6	6	20.0	21	36.2
Safety councils	14	50.0	5	16.6	19	32.7
Traffic control inside buildings	25	90.0	18	60.0	43	74.1
School assemblies on safety (at least once a year)	18	64.3	14	46.6	32	55.2
Home room programs on safety	20	71.4	14	46.6	34	58.6
Using films or slides on safety	4	14.3	4	13.3	8	13.8
Using safety posters distributed by safety organizations	25	89.3	14	46.6	39	67.3
Total number of schools	28	100.0	30	100.0	58	100.0

There are several other different kinds of safety and first aid activities reported by the schools. These are shown in Table XXXI. It is interesting to note the extent of the swimming facilities. In the junior high schools eleven teach swimming to a total of 7,869 pupils during the year. Eighteen senior high schools reported a total of 6,485 pupils enrolled in swimming classes for the year. On this basis 14,354 pupils, out of a total enrollment of 79,276 in the 58 schools, are given some opportunity to learn to swim. This would show that some form of swimming instruction is given in 39 per cent of the junior high schools and 60 per cent of the senior

high schools. In addition, 36 per cent have first aid clubs, 55 per cent are teaching life saving, 76 per cent have a school nurse on duty, and practically all schools have physical directors supervising gymnasium and athletic activities where a large proportion of school accidents are found to take place. (See Table IX.)

TABLE XXXI

OTHER SAFETY AND FIRST AID ACTIVITIES IN SECONDARY SCHOOLS

Activities	Junior High		Senior High		Total	
	No. Having	Per Cent Having	No. Having	Per Cent Having	No. Having	Per Cent Having
First aid club	11	39.3	10	33.3	21	36.2
Teaching swimming in school*	11	39.3	18	60.0	29	50.0
Teaching life saving in school	16	57.1	16	53.3	32	55.2
Having school nurse	25	89.3	19	63.3	44	76.2
Physical director for boys	28	100.0	27	90.0	55	94.8
Physical director for girls	28	100.0	30	100.0	58	100.0
Making school posters on safety	23	82.1	12	40.0	35	60.3
Using one or more safety magazines	17	60.7	9	30.0	26	44.8
Total number of schools	28	100.0	30	100.0	58	100.0

* A total of 6,485 was reported as enrolled in swimming classes in 18 senior high schools and 7,869 were enrolled in 11 junior high schools.

It has already been pointed out that this survey does not represent the average practice in the secondary schools in the country. It shows only what is being done in the schools concerned. A much more extended study should be made to show national practice. It was interesting to note that in the National Council survey[1] of the activities of safety patrols in 103 cities in the United States 48 per cent reported safety patrols. However, this did not mean that all schools in each city had patrols.

Without any question, according to the evidence in the National Council survey,[2] patrols relieve the drain on the police traffic squads during the rush hours. Moreover, the use of patrols and councils for safety work gives a good contact with the police department and an opportunity for pupils to assume the responsibility of protecting

1 Engineering Committee, Public Safety Division. *The Traffic Work of Police Departments.* Chicago: National Safety Council, 1928, 31 p.

2 *Ibid.*, p. 21-22.

their schoolmates in a very definite way. Police officials in many cities feel that the work of patrols and councils is worth while. Table XXXII shows the number and size of patrols in the 48 cities of the United States. These patrols are found largely in elementary and junior high schools.

TABLE XXXII

NUMBER AND SIZE OF PATROLS IN CITIES*

Population in Thousands	No. of Cities	Av. No. of Schools	Av. No. Boys in Patrols	Boys per School in Patrols
20- 49	6	11.6	109.5	9.5
50- 99	12	18.3	167.4	9.1
100-249	9	26.2	493.9	13.6
250-499	12	56.7	661.6	11.7
500-999	6	51.8	593.8	11.5
Over 1000	3	313.5	3875.1	12.4
Average for 48 cities		52.2	622.6	11.9

* From the *Traffic Work of Police Departments*, National Safety Council, 1928.

Table XXXII shows that the average number of pupils used in patrols for each school is 12. On a basis of two pupils to each crossing, this would take care of six crossings near the school building. However, in some cases there is a smaller number of dangerous crossings near schools and members of patrols may be assigned to work for only a part of the time that the patrols are on duty.

THE ACTIVITIES OF SAFETY PATROLS AND COUNCILS

The next step was to determine the activities of safety patrols and councils in some of the schools in which these activities were found. A questionnaire was sent to 75 schools in various parts of the country. Most of these schools were located in different cities in various sections of the country. Since the plan used for patrol and council activities in one school in a city is usually the same for other schools of that city, the sampling secured gives a fair indication of common practice in some of the larger cities in the country. Table XXXIII shows the activities of patrols and councils in 40 secondary schools.

TABLE XXXIII

ACTIVITIES OF SAFETY PATROLS AND SAFETY COUNCILS IN SECONDARY SCHOOLS

Activities	Number of Schools Reporting this Activity
Patrols—Number reporting	40
Supervise traffic within buildings	33
Supervise activities on playgrounds	24
Report accidents or hazards	34
Receive instructions from the police	15
Stand in middle of the street to direct vehicular traffic	6
Utilize flags or other signals	9
Councils—Number reporting	27
Meet regularly to take up safety problems	25
Have constitutions and by-laws	17
Have associate membership besides regular membership	14
Give demonstrations of work in school assemblies	16

In some cities the patrols are organized under the direction of the department of physical education; other cities such as Detroit have a special supervisor of safety; still others are organized under the direction of the local safety council, the automobile club, or the police department. In the majority of schools studied the patrols are selected by principals or sponsors and meet weekly or bi-weekly. Most schools do not favor the plan of having patrols direct traffic from the middle of the street. It becomes a question as to whether or not young boys are capable of doing the work that is ordinarily the work of the police force. In many schools patrols are on duty at recess when streets are closed to vehicular traffic. At the present time there is no satisfactory method of measuring the value of patrols and councils in reducing accidents. We only know that there are very rarely accidents at crossings where patrols are on duty.

CONCLUSIONS

1. There are many safety activities, some of which are not ordinarily included in the curricular activities, that are found in secondary schools.
2. Some fire prevention activities were found in nearly all schools studied. Fire drills, special assemblies, home room programs,

the use of inspection blanks, and the use of motion pictures on fire prevention were the most common activities that were reported.

3. Safety patrols and safety councils are found in many junior high schools and in some senior high schools. In most schools an attempt is made to control traffic within the school building. School assemblies and home room programs on safety were found in approximately 50 per cent of the schools studied.
4. In addition to the activities reported above many schools teach swimming and life saving, and others teach first aid. These are forms of safety activities.
5. Nearly one-half of the 105 larger cities in the country have patrols in their schools. These patrols average 12 pupils to a school and are most commonly found in elementary and junior high schools.

CHAPTER IX

SAFETY MATERIALS IN SECONDARY SCHOOL TEXTBOOKS

One significant measure of the importance of safety education is found in the amount of instructional material which has been embodied in school textbooks. The textbook represents an evaluation of what the author feels are the most significant features in connection with the problems of safety education. Although inclusion of subject matter in textbooks is not necessarily a validation of such subject matter, it represents the opinions of experts in various fields concerning the importance of certain elements. A good picture of current practice in safety education can be presented by an analysis of textbooks.

Several studies of the health and safety items in school textbooks have been made in the past few years. Ruth Strang in 1926[1] made an analysis of contents of school textbooks and courses of study in health in the elementary schools. Dr. Strang determined the number of statements and the frequency of mention in textbooks and courses of study and tabulated a total of 12,520 items. Lois Meier in 1927 made a study of health material in high school science textbooks.[2] Miss Meier made a careful study of the actual amount—a line count or its equivalent in illustrations and tables—in sixteen high school textbooks and twelve laboratory manuals. It was found that 50 per cent of the biology, 32 per cent of the general science, 11 per cent of the chemistry and 2 per cent of the physics textbooks consisted of health material.

These two studies represent typical methods of determining contents in school textbooks. For the purposes of the present study (determining the variety and amount of safety material in high school books) a method similar to that used by Dr. Strang seemed best suited. The actual line or page count is not necessarily a measure of the relative value of the instructional materials included. In many cases a single line in italics such as, *Phosphorus should never be cut in the open but always under water;* or *Never remain*

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[1] Strang, Ruth. *Subject Matter in Health Education.* Teachers College, Columbia University, Contribution to Education, No. 222, 1926. 108 pages.

[2] Meier, Lois. *Health Materials in Science Textbooks.* Lincoln School of Teachers College, Columbia University, 1927. 104 pages.

in a closed garage with an automobile motor running; or, *Carbon monoxide fumes are very dangerous,* in a chemistry text might have as much real safety value as an entire page about the work of the city traffic police.

The method of making the analysis was as follows: Several of the more recent textbooks in general science, biology, community civics, problems of democracy, physics, chemistry, health education and home economics were selected. No attempt was made to select the text on a basis of its ranking in frequency of use in the United States. The investigator then proceeded to organize the material of the textbook into general units such as, "Safety in Transportation" in general science; "Protection against Fire" in civics; "First Aid" in health science; "Safeguarding our Forests" in biology; and "Causes and Prevention of Fires" in chemistry.

The next step was to go through each book and list the various items of safety knowledge or safety suggestions. The frequencies of the various items were then determined by finding the number of times that such items appeared in the books analyzed. Considerable difficulty was met with in determining whether or not certain items should be considered a part of safety education. Safety is so intimately tied up with hygiene and sanitation that in many cases there is likely to be overlapping. In fact, such subjects as first aid and industrial hygiene may well be classified under several heads. For the purposes of this analysis, however, an attempt was made to select only those materials from health education in general that were tied up with the protection of life. Obviously, the problems of industrial poisons, public accidents, and prevention of fires are typical examples of materials in safety education. Considered in the broad conception laid down in the first chapter, a conception that is common to most courses of study that have been organized in the field, safety education provides for the safeguarding of life, health, and property.

As a check of the work of the investigator a single book in each field was examined by a second person. In general there was very little change in the items except in cases of a question of interpretation of the items as bearing on safety education.

In the tables which follow no implication is made regarding the comparative merits of the instructional material in safety found

in the various books. This will have to be a subject for further study. Furthermore, no reliable evidence is available to show the merits of various materials. The investigator attempted to show only the comparative frequency of mention of certain safety items in textbooks. The principal purposes of this part of the study were as follows:

1. To find out the kinds of safety materials included in secondary textbooks.
2. To point out inadequacies in safety materials as presented in textbooks from a standpoint of the comparative importance of the subject and the frequency of mention in the texts.
3. To suggest a placement for instructional materials validated in studies of accidents and safety activities in preceding chapters.
4. To determine the most important safety items to be emphasized in building up a test in safety education.

In the selection of items of safety information, no measure was taken of the length of the sentence or paragraph in which the item was found. In some cases these were found in tables, illustrations, and questions at the end of the chapter. The following are typical examples of safety items:

Precautions must be taken in the synthesis of hydrogen and oxygen.

Fire losses in the United States are increasing yearly.

Toadstools are poisonous and should not be confused with mushrooms.

Wires inside buildings should be placed in conduits to prevent short circuits.

There are several other subjects besides those analyzed in the tables which follow in which some safety information was found. These include economics, geography, home economics, physiology,

zoology, agricultural education, vocational education, junior business training, and general mathematics. No attempt was made to analyze books in these subjects.

In order to make this analysis of items, a check list has been used for the different subjects. This is illustrated in the analysis of chemistry textbooks. The items in each subject have then been grouped into common headings such as "The Prevention of Automobile Accidents" or "Fire Prevention." Some of these headings included specific accident prevention; others suggested general safety; still others dealt with safety from a standpoint of first aid, the work of safety organizations and safety in health. The check list for chemistry items, illustrating the method of analyzing textbooks, will be found in Appendix A.

CHEMISTRY

An analysis was made of the information concerned with safety in six high school chemistry textbooks. The books selected included some of the more recent general chemistries, one chemistry of the home and two practical chemistries.

CHEMISTRY TEXTBOOKS ANALYZED

Author	Title	Publishers	Code	Date of Publication
Black and Conant	*Practical Chemistry*	Macmillan	B.C.	1927
Bradbury	*A First Book in Chemistry*	D. Appleton	B	1928
Weed	*Chemistry in the Home*	American Book Co.	W.	1915
Greer and Bennett	*Chemistry*	Allyn and Bacon	G.B.	1926
Newell	*Practical Chemistry*	D. C. Heath & Co.	N.	1922
Brownlee and Others	*Elementary Principles of Chemistry*	Allyn and Bacon	B.O.	1926

The items were classified first according to units of instruction. This classification is shown in Table XXXIV.

TABLE XXXIV

SUMMARY OF SAFETY ITEMS IN SIX HIGH SCHOOL CHEMISTRY TEXTBOOKS*

Subject	Number of Items by Textbook							
	B. C.	B.	W.	G. B.	N.	B. O.	Total	Mean
Oxygen and oxidation	7	5	3	1	2	6	24	4.0
Hydrogen	1	1	0	2	2	1	7	1.2
Water	4	2	3	6	4	6	25	4.1
Carbon and its compounds	6	7	5	4	3	8	33	5.4
The halogens	6	7	6	7	7	7	40	6.6
Acids, bases, and salts	2	0	3	2	3	3	13	2.2
Ammonia and its compounds	2	2	3	3	3	3	16	2.7
Nitrogen and its compounds	4	4	2	0	1	1	12	2.0
Sulphur and its compounds	2	2	4	4	3	7	22	3.7
Sodium and potassium	3	3	2	3	2	3	16	2.7
The phosphorus family	4	5	3	4	0	8	24	4.0
Fuels, oils, and oil products	8	8	9	10	7	11	53	8.8
The metals	0	3	0	2	2	0	7	1.2
Chemistry of the home	2	1	1	1	2	0	7	1.2
Total	51	50	44	49	41	64	299	49.8

* The letters at the top of the table refer to the textbooks in the study. (See code above.)

It was found that there was a total of 299 items devoted to safety in the six textbooks examined. This gave an average of 49.8 items per textbook. There seems to be comparatively little difference in the relative importance of safety in the six books. In general, the more recent textbooks appeared to have a larger number of safety items. This is an excellent indication of the attempt on the part of authors to present up-to-date material.

The safety items were then classified according to such safety units as "First Aid" and "Causes and Prevention of Fires." Table XXXV shows this classification.

TABLE XXXV

DISTRIBUTION OF SAFETY ITEMS IN CHEMISTRY TEXTBOOKS, CLASSIFIED BY TOPICS

Units	Number of Items by Textbook							
	B. C.	B.	W.	G. B.	N.	B. O.	Total	Mean
Causes and prevention of fires	5	6	4	2	4	5	26	4.3
Laboratory precautions	10	6	5	7	5	11	44	7.3
Dangers of chemicals in life	12	16	6	12	7	15	68	11.3
Safe uses of chemicals	15	17	18	15	15	19	99	16.5
First aid	5	2	6	6	6	7	32	5.3
Securing a safe water supply	4	3	5	7	4	7	30	5.0
Totals	51	50	44	49	41	64	299	49.7

HEALTH AND HYGIENE

Health and safety have been very closely allied in school work as they are in industry. The supervision of safety activities in the schools has, in most of the schools investigated, been under the direction of the health and physical education departments. It is altogether natural that considerable safety material would be found in health and hygiene textbooks. The books that have been analyzed in this particular field are primarily designed for the junior high school, although in some cases they are used in the senior high school.

HEALTH TEXTBOOKS ANALYZED

Author	Title	Publishers	Code	Date of Publication
Winslow	*Healthy Living*	Charles E. Merrill	W.	1924
O'Shea and Kellogg	*The Body in Health*	Macmillan	O.	1924
Burkard, Chambers, Maroney	*Health Habits*	Lyons and Carnahan	B.C.	1925
Blount	*Health, Public and Personal*	Allyn and Bacon	B.	1922

TABLE XXXVI

SAFETY ITEMS IN HEALTH TEXTBOOKS

Subject	Number of Items by Textbook					
	W.	O.	B. C.	B.	Total	Mean
Prevention of automobile accidents	6	..	2	14	22	5.5
Prevention of drowning accidents	8	..	4	8	20	5.0
Fire prevention	8	..	3	8	19	4.8
Railroad accidents	7	..	3	3	13	3.3
Treatment for poisons	5	..	5	0	10	2.5
Hazards of poisonous gases	3	2	0	3	8	2.0
Industrial accidents	2	1	0	3	6	1.5
Electrical hazards	2	0	1	1	4	1.0
Danger of falls	2	0	0	2	4	1.0
Danger of firearms	2	..	..	1	3	.8
Safety in hygiene and sanitation	16	11	12	13	52	13.0
Securing safe drinking water	1	..	2	1	4	1.0
The work of health organizations	7	..	5	7	19	4.8
Prevention of diseases	11	1	8	16	36	9.0
First aid	7	2	7	7	23	5.8
Total	87	17	52	87	243	61.0

GENERAL SCIENCE

It is to be expected, from the very nature of the subject matter of general science, that there will be considerable safety material found in textbooks on that subject. General science is relatively new in the secondary school curriculum and much of the content has been based on the needs of everyday life and an understanding of the environment. It was found in the analysis that the average general science textbook contained 62.5 safety items, the largest number in any of the high school textbooks. Moreover, the information in general science apparently has an added advantage in that it is much more specific and closely related to the life of the pupil than the information in problems of democracy or physics. In the six textbooks examined, the range in the number of safety items was from 49 to 72 with a mean of 62.5. Although the total number of items in textbooks varied but litttle for the majority of the books, there was a wide difference in the number of items in the separate units as is shown in Table XXXVII.

GENERAL SCIENCE TEXTBOOKS ANALYZED

Author	Title	Publishers	Code	Date of Publication
Hodgdon	*Elementary General Science*	Hinds, Hayden & Eldridge	H.	1925
Hunter & Whitman	*Civic Science in Home and Community*	American Book Co.	H.W.	1923
Pieper & Beauchamp	*Everyday Problems in Science*	Scott, Foresman	P.	1925
Trafton	*Science of Home and Community*	Macmillan	T.	1926
Van Buskirk & Smith	*The Science of Everyday Life*	Houghton Mifflin	V.	1925
Wood & Carpenter	*Our Environment: How We Use and Control It*	Allyn and Bacon	W.	1927

The difference in the number of safety items in certain units was striking. The items on the subject *transportation by water, land, and air* varied from 1 to 22; in *first aid* the range was from

6 to 22; in *safety in generating and using electricity* the range was from 1 to 7. This difference in emphasis upon the safety side of the subject matter accounts for much of the variation in the number of items found in the different books.

TABLE XXXVII

SAFETY ITEMS IN SIX GENERAL SCIENCE TEXTBOOKS

Subject	Number of Items by Textbook							
	H.	HW.	P.	T.	V.	W.	Total	Av.
Causes of fire and fire prevention	18	15	14	17	12	11	87	14.5
First aid and hygiene	22	6	10	9	6	16	69	11.5
Transportation by water, land and air	12	5	6	22	1	12	58	9.7
Air, weather, ventilation	6	7	8	5	11	7	44	7.3
Safe water supply and sewerage disposal	4	9	6	6	7	9	41	6.8
Safety in health and foods	4	7	1	3	7	6	28	4.7
Safety in generating and using electricity	1	2	4	5	7	5	24	4.0
Forests and conservation of resources	..	4	..	5	3	4	16	2.7
Safety in the work of police and fire departments	..	6	..	..	..	2	8	1.3
Total	67	61	49	72	54	72	375	62.5

COMMUNITY CIVICS

Seven community civics textbooks were analyzed. These included nearly all of the recent books that were available. A total of 307 safety items was found in the seven textbooks with an average of 43.7 items for each book. The range in the number of items was from 32 to 64. As was the case in general science, fire prevention was given the most important place with 35 per cent of the total number of items. No mention was made of the dangers of drowning, falls, and firearms in any of the textbooks. In five of the seven textbooks some mention was made of the problem of automobile accidents but the number of items was only 4.5 per cent of the total.

COMMUNITY CIVICS TEXTBOOKS ANALYZED

Author	Title	Publishers	Code	Date of Publication
King & Barnard	*Our Community Life*	John C. Winston Co.	K.	1926
Hughes	*Community Civics*	Allyn and Bacon	H.	1927
Levis	*Citizenship*	Harcourt, Brace	L.	1923
Dunn	*Community Civics for City Schools*	D. C. Heath & Co	D.	1928
Hill	*Community Civics*	Ginn	Hi.	1928
Hepner	*The Good Citizen*	Houghton Mifflin	HH.	1924
Broome and Adams	*Conduct and Citizenship*	Macmillan	B.	1926

TABLE XXXVIII

SAFETY ITEMS IN COMMUNITY CIVICS TEXTBOOKS

Subject	Number of Items by Textbook								
	K.	H.	L.	D.	Hi.	HH.	B.	Total	Mean
Cause and prevention of fires	25	13	12	12	16	12	16	106	15.1
Safety work of national and private organizations	8	7	3	9	7	5	6	45	6.4
Safety in health	6	7	5	5	3	5	7	38	5.4
City planning and street safety	5	4	4	4	5	2	5	29	4.1
Prevention of industrial accidents	6	8	6	2	1	0	4	27	3.9
Prevention of forest fires	6	1	8	0	5	5	1	26	3.7
Automobile accidents	5	1	0	4	0	1	3	14	2.0
General accident prevention	3	0	2	0	0	0	3	8	1.1
The value of insurance	0	1	2	2	0	2	2	9	1.3
Railway accidents	0	2	0	0	0	0	3	5	.7
Total	64	44	42	38	37	32	50	307	43.7

BIOLOGY

Six biology textbooks were analyzed in connection with this study. These included some of the more commonly used high school textbooks. A total of 291 items concerned with some phases of safety was found in the six books, giving an average of 48.5 items per book. The range in number of items was from 41 to 64. Apparently there was considerable difference in the ideas of the authors regarding the place of safety in biology. In textbook G, for example, 11 items were found in the field of industrial safety in hygiene while the average number in other books was less than 0.9. In all textbooks considerable emphasis was placed upon the subject of the dangers of and the treatment for different kinds of poisons. The analysis is shown in Table XXXIX.

BIOLOGY TEXTBOOKS ANALYZED

Author	Title	Publishers	Code	Date of Publication
Atwood	*Biology*	P. Blakiston	A.	1927
Hunter	*New Civic Biology*	American Book Co.	H.	1926
Gruenberg	*Biology and Human Life*	Ginn and Co.	G.	1925
Moon	*Biology for Beginners*	Henry Holt	M.	1926
Peabody and Hunt	*Biology and Human Welfare*	Macmillan	P.	1925
Smallwood, Reveley and Bailey	*New Biology*	Allyn and Bacon	S.	1924

TABLE XXXIX

SAFETY ITEMS IN BIOLOGY TEXTBOOKS

Subject	Number of Items by Textbook							
	A.	H.	G.	M.	P.	S.	Total	Mean
Safety in prevention of diseases	13	14	15	13	14	13	82	13.7
Safety in hygiene and sanitation	12	10	14	11	11	10	68	11.3
Prevention and treatment of poisons	11	4	4	7	5	5	36	6.0
Conservation of resources	7	6	7	7	5	6	38	6.3
First aid	2	3	5	8	5	8	31	5.2
Securing a safe water supply	2	3	4	2	..	4	15	2.5
Industrial hygiene and safety	3	1	11	..	..	..	15	2.5
Prevention of gas poisoning	1	..	4	..	1	..	6	1.0
Total	51	41	64	48	41	46	291	48.5

PROBLEMS OF DEMOCRACY

Four textbooks in "Problems of Democracy" were analyzed and a total of 103 items concerned with safety were found. There was some difficulty in interpreting the materials of the textbooks, because many of the items dealt with safety from a general point of view with but very few specific safety suggestions. The study revealed considerable difference in the number of items concerned with safety, the range being from 10 to 38 with a mean of 25.8. The number of items in one text, T, was due largely to special stress on the problems of industrial accidents and occupational diseases.

TEXTBOOKS ANALYZED

Author	Title	Publishers	Code	Date of Publication
Hughes	*Problems of American Democracy*	Allyn and Bacon	H.	1922
Greenan & Meredith	*Everyday Problems of American Democracy*	Houghton Mifflin	G.	1927
Burch and Patterson	*Problems of American Democracy*	Macmillan	B.	1927
Towne	*Social Problems*	Macmillan	T.	1925

TABLE XL

SAFETY ITEMS IN PROBLEMS OF DEMOCRACY TEXTBOOKS

	Number of Items by Textbook					
	H.	G.	B.	T.	Total	Mean
How industry is preventing accidents and diseases	9	3	12	18	42	10.5
How communities are being made safer	8	2	5	6	21	5.3
Protecting forests and other natural resources	3	4	4	3	14	3.5
The safety activities of national and state government	6	1	1	6	14	3.5
Safeguarding life and health	1	0	6	5	12	3.0
Total	27	10	28	38	103	25.8

PHYSICS

In physics five textbooks were studied. A total of 63 safety items were found in the five books giving an average of 12.6 items per book. The range was from 9 to 18. It might be expected that physics would give an excellent opportunity to include considerable material on the very important safety devices found today on automobiles, airplanes, dirigibles, submarines, machinery, furnaces, ocean steamships and railways. However, very few items of this nature were found. In spite of the fact that considerable space in the textbooks was devoted to electricity and magnetism there was almost no mention of the important electrical hazards of the home and industry.

PHYSICS TEXTBOOKS ANALYZED

Author	Title	Publishers	Code	Date of Publication
Millikan and Gale...	*Elements of Physics*...	Ginn and Co.....	M.	1927
Fuller, Brownlee, Baker.....	*Elementary Principles of Physics*...	Allyn and Bacon....	F.	1925
Black and Davis....	*Practical Physics*....	Macmillan.....	B.	1925
Henderson.....	*Physics in Everyday Life*.....	Lyons & Carnahan...	H.	1925
Carhart and Chute...	*Practical Physics*....	Allyn and Bacon....	C.	1927

TABLE XLI

SAFETY ITEMS IN PHYSICS TEXTBOOKS

Subject	Number of Items by Textbook						
	M.	F.	B.	H.	C.	Total	Mean
How machines are made safer.....	6	6	5	5	2	24	4.8
Safety in everyday life.....	5	4	10	5	4	28	5.6
Prevention of electrical accidents.....	2	3	3	..	3	11	2.2
Total.....	13	13	18	10	9	63	12.6

In order to secure a summary of the safety items in the seven subjects that have been analyzed, the preceding tables have been combined into Table XLII. The items have been classified under four general headings:

1. Specific accident prevention such as, "Prevention of automobile accidents."
2. First aid.
3. General safety, or safety in certain occupations such as, "What the national and state governments are doing in safety," or "How machines are made safer."
4. Safety in its relationship to health such as, "How to secure a safe supply of drinking water."

This particular study is concerned primarily with the first three of these but the fourth was included to show the general relationship of safety and health. Table XLIII shows that, of the total of 304.9 items in average textbooks in the seven subjects, *fire prevention* ranks first with 38.7 items, followed by *hygiene and sanitation* with 34.4 items; *first aid* with 27.8 items; *disease prevention* with 23.1 items; and *prevention of industrial accidents* with 17.4 items. *The prevention of automobile accidents* and *the prevention of drowning accidents,* the two most common causes of accidental death in the secondary school age period, had 11.9 items and 5.0 items respectively.

TABLE XLII

SUMMARY OF SAFETY ITEMS IN 38 SECONDARY SCHOOL TEXTBOOKS*

Subject	Average Number of Items in Books							
	H.†	G.	B.	P.	C.	C.C.	P.D.	Total
1. Specific Accident Prevention:								
Causes and prevention of fires	4.8	14.5	...	..	4.3	15.1	...	38.7
Prevention of industrial accidents and diseases	1.5	...	2.5	..	...	3.9	9.5	17.4
Prevention of automobile accidents	5.5	4.4	...	..	...	2.0	...	11.9
Railroad and water transportation accidents	3.3	4.3	...	..	...	.7	...	8.3
Hazards of poisonous gas	2.5	1.0	1.0	..	3.0	...	...	7.5
Dangerous poisons and their treatment	2.5	...	6.0	..	...	...	...	8.5
Prevention of electrical accidents	1.0	4.0	...	2.2	...	...	...	7.2
Drowning accidents	5.0	...	...	..	...	...	...	5.0
Dangers of falls	1.0	...	...	..	...	...	...	1.0
Firearms accidents	.8	...	...	..	...	...	...	.8
Total	27.9	28.2	9.5	2.2	7.3	21.7	9.5	106.3

* Does not include the 9 first aid books reported in Chapter VII.
† The letters at the top of these columns indicate the subject.
H.—Health G.—General Science B.—Biology P.—Physics C.—Chemistry C.C.—Community Civics P.D.—Problems of Democracy

TABLE XLII—(Continued)
SUMMARY OF SAFETY ITEMS IN 38 SECONDARY SCHOOL TEXTBOOKS*

Subject	Average Number of Items in Books							
	H.†	G.	B.	P.	C.	C.C.	P.D.	Total
2. First Aid	5.8	11.5	5.2	..	5.3	...	...	27.8
3. General safety or safety in certain occupations:								
Safe use of chemicals in life	...	...	...	..	16.5	...	...	16.5
Forests and conservation of resources	...	2.7	5.2	..	...	3.7	3.5	15.1
Safety in everyday life	...	1.3	...	5.6	...	5.2	5.3	17.4
The work of the National and State Government	...	...	...	..	...	6.4	3.5	9.9
Dangers of chemicals in life	...	...	...	..	9.3	...	...	9.3
Laboratory precautions in chemistry	...	...	...	..	7.3	...	...	7.3
Air, weather and ventilation	...	7.3	...	..	...	...	...	7.3
How machines are made safer	...	...	...	4.8	...	...	...	4.8
Protection through insurance	...	...	...	..	...	1.3	1.0	2.3
Total	...	11.3	5.2	10.4	33.1	16.6	13.3	89.9
4. Safety in Health:								
Hygiene and sanitation	13.0	4.7	11.3	..	...	5.4	...	34.4
Safety in preventing disease	9.4	...	13.7	..	...	...	...	23.1
Water supply and sewerage disposal	1.0	6.8	2.8	..	5.0	...	...	15.6
The work of health organizations	4.8	...	...	..	...	...	3.0	7.8
Total	28.2	11.5	27.8	..	5.0	5.4	3.0	80.9
Grand Total	61.0	62.5	48.5	12.6	49.8	43.7	25.8	304.9
Number of textbooks analyzed	4	6	6	5	6	7	4	38
Total items in all books	244	375	291	63	299	307	103	1682

* Does not include the 9 first aid books reported in Chapter VII.
† The letters at the top of these columns indicate the subject.
H.—Health P.—Physics C.C.—Community Civics
G.—General Science C.—Chemistry P.D.—Problems of Democracy
B.—Biology

IS THE PRESENT EMPHASIS ON SAFETY MATERIAL IN TEXTBOOKS ADEQUATE TO THE NEEDS OF THE PUPILS?

The analysis of the 38 textbooks as summarized in Table XLII shows the relative emphasis that is being placed on different phases of safety. It is important to determine whether or not this emphasis

may be justified by the needs of everyday life. What criterion may be set up to represent the needs of everyday life in the secondary school age period?

The United States Census Bureau report for accidental deaths in 1927 gives the total number of deaths for specific causes by age-groups. The best picture of the fatalities for the secondary age period will be found in the distribution for the 10-19 age group. This leads to the first criterion: *One of the best indications of the educational needs of the secondary age group is the comparative importance of different accidents as a cause of fatal or non-fatal injuries.* Accidents, fatal and non-fatal, are, to a certain extent, indications of educational shortage. For purposes of comparison, inasmuch as there are no reliable data available to show the ratio of fatalities to non-fatalities for various accidents, the comparative number of deaths for each cause was used as the measure of the importance of the cause. In Table XLIII which follows, the number of items in textbooks concerned with certain accidents has been compared with the number of fatalities in the 10-19 age-group for the same kind of accident.

TABLE XLIII

COMPARISON BETWEEN IMPORTANCE OF CERTAIN ACCIDENT FREQUENCIES IN TEXTBOOKS AND CAUSES OF FATALITY IN THE 10-19 AGE-GROUP

Accident	Number of Items (1)	Per cent of Total (2)	Fatalities Age 10-19* (3)	Per Cent Total (4)	Ratio Col. 2 to 4 (5)
Causes and prevention of fires	38.7	43.5	614	6.1	7.1
Prevention of automobile accidents	11.9	13.4	2914	28.8	.5
Railroad and water transportation accidents	8.3	9.3	883	8.7	1.1
Poisonous gases	7.5	8.4	130	1.3	6.5
Dangerous poisons	8.5	9.5	144	1.4	6.9
Electrical accidents	7.2	8.1	160	1.6	5.1
Drowning accidents	5.0	5.6	2042	20.2	.25
Dangers of falls	1.0	1.1	588	5.8	.2
Firearms accidents	.8	.9	1011	10.1	.1
Injuries by other vehicles	0	0	252	2.5	0
Lightning	0	0	112	1.1	0
Landslide or crushing	0	0	100	1.0	0
Injuries by animals	0	0	90	.9	0
Traumatism by machines	0	0	290	2.9	0
Mining accidents	0	0	177	1.7	0
Other external violence	0	0	620	6.1	0
Total	88.9	100.0	10127	100.0	

* Estimates from Census Bureau reports, Department of Commerce.

The comparison between the importance of different accidents in textbooks and the needs of life during this period is striking. The physical hazards of life in which secondary school pupils are living are evidently considerably different from those given emphasis in school textbooks. There appears to be a definite lack of validated safety subject matter in textbooks. Nearly one-half of the items listed deal with fire prevention, while only 6 per cent of the fatalities at this period of life are due to burns and conflagration. Many other kinds of accidents which caused as many fatalities as fires are either not mentioned or wholly inadequate treatment is given to them.

Automobile accidents received altogether too little attention in textbooks. Although such accidents cause five times as many fatalities as fires and burns, the total number of items presented in the average textbooks in the seven subjects was only 25 per cent of the number of items on fires and fire prevention. The automobile is one of our more recent hazards of life and a most serious danger. Since 1918 the number of motor vehicles has increased over 300 per cent and since 1911 the motor vehicle fatalities have increased 1,050 per cent.[3] With over 23,000,000 motor vehicles on the highways of the United States and with an average of one motor vehicle out of each eleven registered in an accident yearly, the subject of the prevention of such accidents through education cannot be neglected.

It was found that in the thirty-eight textbooks, except in certain health books, no mention was made of the prevention of drowning accidents. Next to motor vehicles, drowning is the most important cause of accidents at the high school age and approximately 30 per cent of the 8,067 fatalities in 1927 were among persons between the ages of 10 and 19. It might be expected that in some classes of physical education and swimming the importance of avoiding certain errors in connection with the water would be stressed. It is unfortunate, however, that in community civics, general science, or biology little or no mention is made of this subject.

The same could be said relative to the dangers of home accidents in the use of electricity, the use of firearms, dangers of falls and machinery. In all of the books there is little or no mention of these subjects. Some of these subjects do not lend themselves as readily to treatment in textbooks as do some others. Yet the

[3] *Accident Facts, 1928.* National Safety Council, p. 7.

does not excuse writers of physics textbooks from eliminating almost entirely the problem of the hazards in the use of electricity. An average of 2.2 items or two or three sentences in the average physics textbook, where from 100 to 170 pages may be devoted to electricity, is hardly meeting the needs of life.

The prevention of railroad accidents, danger of poison gases and the prevention and treatment of poisons have been given adequate emphasis in textbooks. Industrial accidents and occupational diseases have received considerable stress but there is a tendency to give too much emphasis to occupational diseases and neglect the work that is being done by industry in accident prevention. On the assumption that within a few years a large percentage of the secondary school population will be employed in industry, it is quite important that pupils learn what is being done to prevent accidents.

A total of 27.8 items in first aid were found in the seven subjects. The analysis of first aid needs as reported in Chapter VII indicates that these books do not present sufficient material for a good first aid course unless supplemented by other first aid manuals. Furthermore, there is considerable doubt as to whether or not first aid instructional materials in the four different subjects would be as valuable as a single course in first aid such as recommended by the National Red Cross.

In this discussion of the adequacy of the safety materials one factor has not been introduced. It has been assumed that all pupils, at some time in their secondary school career, will take the seven subjects that have been analyzed. As a matter of fact, only a small percentage of the secondary school enrollment take all of these subjects. A very large per cent who enter the junior high school do not go on to the senior high school. Of those who do go on, many take commercial courses; others take practical arts or vocational courses; still others enroll in academic courses and do not elect the physics, chemistry, and biology. As a result, only a comparatively small percentage of all secondary school pupils would be enrolled in all of these subjects.

Yet the dangers of life are common to all. The hazards of our physical environment which may cause injury or death are not limited to any special group. It is for this reason that as much as possible of that which is essential in safety education should be placed in junior high school grades before pupils leave school.

General science, community civics, and health are subjects which are relatively common to junior high schools and according to the analysis of Table XLII contain a large percentage of the safety materials. This explains why such a large part of the content that is given in Chapter V has been suggested for these three junior high school subjects.

The following conclusions are drawn regarding the adequacy of safety materials in school textbooks:

1. The number of items regarding specific kinds of accidents in secondary school textbooks is not adequate to the needs of pupils, based upon the relative importance of various accidents in the secondary school age period.
2. In order to reach all pupils, much of the safety material should be placed in the subjects of the junior high school.
3. There is a considerable difference in school textbooks in any one subject in the amount of material devoted to safety.
4. It is suggested that due to the inadequacy of single textbooks more safety instruction can be given by utilizing supplementary textbooks or other source materials.
5. The first aid materials in textbooks are inadequate to meet the needs of pupils.

CHAPTER X

THE CONSTRUCTION AND USE OF THE SAFETY EDUCATION TEST

In order to determine the safety knowledge of secondary school pupils and to find evidences of educational shortage, the *Safety Education Test, Form Alpha,* was constructed. This test was built up following an analysis of safety items in school textbooks (as shown in Chapter VIII) and courses of study in safety education. The test, which is included in *Appendix A,* is made up of 80 items divided as follows:

Part 1—25 multiple choice items.
Part 2—30 alternate-response items.
Part 3—25 questions that involved the safety knowledge of certain life situations.

The last type of question was used in order to secure a free response of what the pupil thought he would do in certain life situations. It was felt that this type of question would give a better measure of the pupil's knowledge of the question than any of the other objective type questions. The test includes items on motor vehicle safety, fire prevention, home safety, public and industrial safety, first aid, general safety, and water safety. It does not attempt to show what the pupils actually would do in life situations but only measures their knowledge of safety.

The key was made by first giving the test to 100 pupils and tabulating the results. Little difficulty was encountered in making a key for Parts 1 and 2, but considerable trouble was found in making a wholly objective key for Part 3. It would naturally be expected that there would be considerable variety of responses to questions of the type found in Part 3. This problem was finally solved by giving a choice of two or three answers to certain questions.

The test was then revised, submitted to ten judges, including five first aid authorities in representative industries and educational institutions, three safety engineers, and two experts on tests and measurements. The first aid items were then checked against the standards as established by the American Red Cross.[1]

The test, with directions for administering and scoring, was

[1] American Red Cross. *First Aid.*

then printed and given in 36 schools in 10 cities in the country. Table XLIV shows the number of schools, the grades, and the number of pupils that were tested in the different cities.

TABLE XLIV

NUMBER OF PUPILS TESTED, BY CITY AND BY GRADE—NATIONAL SAFETY TEST

City	Number of Schools	Grade	Number of Pupils
St. Louis, Missouri	10	8	1170
Kansas City, Missouri	11	7	551
San Antonio, Texas	8	8	709
Baltimore, Maryland	1	8	187
Bridgeport, Connecticut	1	10, 11, 12	87
New York City, New York	1	12	85
Mt. Vernon, New York	1	8	50
New Rochelle, New York	1	10, 11, 12	52
Upper Nyack, New York	1	8	20
New York, Teachers College	1	Graduate Students	26
Total	36		2937

This testing was inadequate for establishing either age norms or grade norms, but was useful for showing the evidences of educational shortage that appeared in the sampling of tests that was studied.

TABLE XLV

FREQUENCY DISTRIBUTION OF SCORES ON SAFETY TEST, GRADE 8

Score	Number of Cases	
100–104		
95–99	2	
90–94	5	
85–89	14	Median 59.6
80–84	50	
75–79	105	Q_1 51.7
70–74	171	
65–69	316	Q_3 67.3
60–64	344	
55–59	372	Mean 59.3
50–54	272	
45–49	190	S. D. 11.6
40–44	121	
35–39	61	
30–34	37	
25–29	10	
20–24	3	
15–19	2	
N	2075	

The number of tests administered in grades 7, 10, 11, and 12 was inadequate for drawing conclusions, but the results for the test in these grades were as follows:

Grade	Schools	Number of Pupils	Median
7	Kansas City	551	63.2
10	High Schools (3)	98	64.5
11	High Schools (2)	42	70.0
12	High Schools (3)	99	75.0
Graduate Students	Columbia University	26	82.5

The high median for Kansas City may be due to the fact that this city was one of the first to introduce safety education into its schools and has an excellent course of study and well organized instruction. The range in median scores in the eleven schools tested in Kansas City was from 56.2 to 74.6. The range in San Antonio for eight schools was from 56.0 to 62.5.

THE RELIABILITY OF THE TEST

The reliability coefficient was found by splitting the test into halves, correlating the halves by means of the product-moment method of correlation, and correcting for the whole test by the use of the Spearman-Brown formula. A sampling of 100 test papers was used for this correlation. The reliability coefficient for the halves $r_{af.\,Af}$ was found to be .57. Correcting this by the Spearman-Brown formula we have

$$r_{af} = \frac{ar_{11}}{1-(a-1)r_{11}}$$

where a = number of forms totaled
r_{11} = reliability coefficient of one form.

This formula for the correction for a test twice the length of the halves becomes

$$r_{11} = \frac{2r\frac{1}{2}\frac{\text{I}}{\text{II}}}{1-r\frac{1}{2}\frac{\text{I}}{\text{II}}} \text{ or } r_{11} = .74 \pm .030$$

This reliability could doubtless be improved upon, if, instead of correlating the results for grade 8 pupils alone, additional test papers from grades 7, 10, 11, and 12 had been used.

The P. E. of the reliability coefficient was computed by the use of the formula

$$\text{P. E.} = \pm .6745 \frac{(1 - r^2)}{\sqrt{N}} = -\frac{.6745 \; x \; .45}{10} = \pm .030$$

ANALYSIS OF ERRORS

A sampling of 227 tests taken by pupils in grades 7 and 8 in 19 schools was then studied to determine the frequency of error on each question. This sampling was made by arranging tests in order of scores and taking every tenth paper. The frequency of error was then tabulated and the percentage of error for each item of the test was determined as shown in Table XLVI.

It is evident from this table that there is considerable difference in knowledge of some of the different safety problems. On some questions such as numbers 1, 11, and 13 in Part 1; numbers 2, 9, 12, and 25 in Part 2; and numbers 2, 3, and 15 in Part 3; the per cent of error was very small. On the other hand certain other questions gave considerable difficulty. Among these the following were outstanding:

Number	Question	Per Cent of Error
8	The substance that puts out fire in ordinary chemical fire extinguisher	67.7
14	The material found in the Pyrene fire extinguisher	75.3
16	Treatment for acid burns	71.4
17	Treatment for lye or caustic burns	84.6
20	Number of people killed by accident yearly	74.9
21	Danger of corrosive sublimate	56.8
	Part 2	
14	Spontaneous combustion of hay	68.7
28	Shaefer method of artificial respiration	51.0
	Part 3	
1	Danger of asphyxiation	53.3
9	What to do when a boat capsizes	63.9
10	First aid for a person suffering from a fit	62.6
11	First aid for a sprain	68.7
17	First aid for a severe cut	61.7
20	Parking automobile on a steep street	51.1
22	Danger of cutting off forests around streams	66.1
23	First aid for a snake bite	59.9
24	Method used in "tired swimmer" carry	79.3

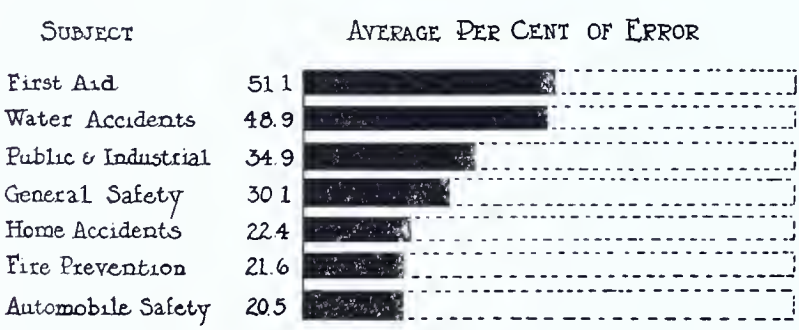
Some of these questions are of much more importance than others. In some cases the lack of knowledge about a certain danger or a method of treating an injury may be of considerable moment. In other cases the knowledge that has been tested may be of no serious importance. By referring to the test in the appendix and Table XLVI the frequency of error for the other items of the test may be seen.

TABLE XLVI

NUMBER AND PER CENT OF ERRORS ON SAFETY TEST
SAMPLING OF 227 TESTS—GRADES 7 AND 8

Question	Number of Questions Answered Correctly					
	Part 1		Part 2		Part 3	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
1	18	7.9	24	10.6	121	53.3
2	13	5.7	14	6.2	22	9.7
3	40	17.6	89	39.2	12	5.3
4	36	15.9	36	15.9	38	16.7
5	107	47.1	53	23.3	53	23.3
6	35	15.4	88	38.8	45	19.8
7	33	14.5	46	20.3	33	14.5
8	131	67.7	26	11.5	53	23.3
9	9	4.0	10	4.4	145	63.9
10	100	44.1	79	34.8	142	62.6
11	16	7.0	8	3.5	156	68.7
12	107	47.1	4	1.8	44	19.4
13	19	8.4	12	5.3	81	35.7
14	171	75.3	156	58.7	30	12.3
15	104	45.8	30	13.2	25	11.0
16	162	71.4	55	24.2	113	49.8
17	192	84.6	24	10.6	140	61.7
18	32	14.1	107	47.1	49	21.6
19	42	18.5	40	17.6	98	43.2
20	170	74.9	37	16.3	116	51.1
21	42	18.5	102	44.9	109	47.0
22	96	42.3	71	31.3	150	66.1
23	129	56.8	93	40.0	136	59.9
24	94	41.4	64	28.2	180	79.3
25	92	40.5	14	6.2	41	18.1
26	...	....	37	16.7	...	....
27	...	....	65	28.6	...	....
28	...	....	118	51.0	...	....
29	...	....	103	45.4	...	....
30	...	....	45	19.8	...	....
Average	147	35.2		24.2		37.4

In order to find out in what fields of safety pupils were best informed and in what fields they had the least information the test items concerned with the various fields of safety were then grouped and the per cent of wrong responses for each field (fire prevention, first aid, etc.) was determined. This showed that pupils were best informed on automobile safety and fire prevention, and had the least information on first aid, the prevention of water accidents, and public and industrial safety. However, there is no evidence that the items in the seven fields were of equal difficulty or equal importance. In most of the schools tested, particularly in Kansas City, St. Louis, Baltimore, and San Antonio, safety education has been stressed in the schools for some time. Figure 7 shows the per cent of errors by subjects in safety in the sampling of 227 tests.



Per Cent of Error on Safety Test by Subjects
Sampling of 227 tests

FIGURE 7

CONCLUSIONS

1. The *Safety Test, Form Alpha* may be used with fair reliability (r=.74) to determine the safety knowledge of secondary school pupils.

2. From a diagnosis of a sampling of the 2075 tests administered in grade eight in 19 schools, it appears that pupils in these schools have the least safety information in the fields of *first aid, prevention of water accidents,* and *public and industrial safety.* They appear to be best informed in the fields of the *prevention of*

automobile accidents, fire prevention, and *the prevention of home accidents.*

For the schools that were studied this would tend to indicate that greater emphasis should be placed on the problems concerned with the first three fields of safety about which pupils appear to have the least information.

3. There is considerable difference between grade medians for different schools in the same cities, and an even greater difference between the grade medians for schools in different cities. There was a general tendency for the safety knowledge of pupils to increase with the grade.

CHAPTER XI

CONCLUSIONS AND APPLICATIONS OF THIS STUDY

Conclusions

The curriculum objectives and materials for enriching the content in secondary school subjects, that have been organized in this study, represent its most important contribution. All of the study has hinged around the problem of validating these materials.

Curriculum materials have been organized in the following subjects:

1. The Causes and Prevention of Motor Vehicle Accidents.
2. The Causes and Prevention of Accidents in Schools.
3. The Prevention of Water Accidents.
4. Prevention of Gas Accidents in the Home.
5. Causes and Prevention of Accidents to Pre-School Children.
6. Prevention of Electrical Accidents.
8. Prevention of Forest Destruction.
7. Fire Prevention.
9. What Industry is Doing to Safeguard Workers.
10. Making Transportation on Steam and Electric Railroads Safer.
11. Safety in Aviation.
12. The Prevention of Accidents in Water Transportation.
13. First Aid.

This material is prepared primarily for the use of teachers of general science, community civics, household arts, biology, physics, problems of democracy, health, physical education, and chemistry.

Incidental to the problem of validating this curriculum several other conclusions are suggested:

1. The analysis of fatal and non-fatal accidents shows that certain kinds of accidents are common during the secondary school age period. The most important of these are motor vehicle, drowning, firearms, railroad, burns and scalds, and falls.

2. At the present time considerable emphasis in secondary schools is being placed on safety education activities—including fire prevention, accident prevention, and first aid.
3. Safety content is found in many secondary school textbooks, particularly textbooks in general science, community civics, health, chemistry, biology, problems of democracy, and physics.
4. The dangers of our environment are constantly changing. The curriculum should be organized to meet these dangers and should be built up primarily around local needs.

APPLICATIONS OF THIS STUDY

1. This material is intended for the use of teachers and administrators who are organizing courses of study in safety education or in secondary school subjects.
2. It does not represent a complete curriculum, but constitutes a core of subject matter and suggests a technique by which school authorities, in the light of local needs, may organize their course of study.
3. It provides for textbook writers a comparative analysis of the safety content in textbooks and the needs of everyday life—as established by the records of fatal and non-fatal accidents. In this sense an accident is assumed to be a failure to respond correctly to a danger in one's environment.
4. The material proposed is not intended to be taught as a separate subject, but rather as a new emphasis on safety in the present secondary school subjects.
5. The safety test provides a method by which local school authorities may determine the safety knowledge of pupils and find out where there are evidences of educational shortage.
6. The industrial age has brought us into a new world—new problems, new dangers, new activities. The curriculum that has been organized represents an attempt to provide educational materials determined by common needs, as represented by an analysis of *educational shortage* and by the *common safety activities* of society.

APPENDIX A. Test.

APPENDIX B. Activities of National and Private Safety Agencies.

APPENDIX C. Bibliography.

APPENDIX A

NATIONAL TESTS IN SAFETY EDUCATION

By HERBERT J. STACK
Fellow in Safety Education

Published by the
NATIONAL BUREAU OF CASUALTY AND SURETY UNDERWRITERS
and approved by
THE EDUCATION DIVISION, NATIONAL SAFETY COUNCIL

SCORE
Part 1 .....
Part 2 .....
Part 3 .....
Total .....

HIGHER EXAMINATION: FORM ALPHA

Read this page carefully. Do as you are told to do.

Do not turn over the page until you are directed to do so. First, fill in the blanks below.

Name..... School..... Date.....

Age—Years.....and Months.....Class (Grade)..... City.....

State.....Number of Years in the Public Schools of this City.....

This test is divided into three parts and directions will be given about what you are to do before each part. The test is to find out (1) how much you know about safety education; (2) what you would do if you were brought face to face with a safety situation that demanded a decision; (3) what your attitudes toward safety are.

DIRECTIONS FOR PART 1

Here are some sample questions below. You will see that one answer best completes the statement that has been made. Draw a line under the right answer and put its number in the parenthesis at the right of the page.

The light in our traffic system that means "Stop" is

(1) orange (2) blue (3) red (4) green.....( )

The answer of course is red; so you should have drawn a line under "red" and placed a figure 3 in the parenthesis.

The most common cause of fires is

(1) lightning (2) spontaneous combustion (3) careless use of matches (4) electrical short circuits ( )

Here you should have drawn a line under "careless use of matches" and placed a 3 in the parenthesis.

The best way to cross a street at a crossing is to

(1) run across between the cars (2) watch for a chance and walk rapidly across (3) wait for a stop in the traffic and walk across..... ( )

The answer here of course is "wait for a stop in the traffic and walk across" and a figure 3 should be placed in the parenthesis.

On the next page you will find a number of questions of this type. Get as many right as you can. You are not expected to get all of them right, but do not go too rapidly so that you will make mistakes. Do not forget to place the number in the parenthesis.

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National Bureau of Casualty and Surety Underwriters

PART 1

1. It is best to cross the street when there is heavy traffic
   (1) at the crossing (2) in the middle of the block (3) anywhere, if you can run fast enough (4) on the sidewalk..... ( )
2. Oily rags should be placed in
   (1) metal cans (2) wooden boxes (3) the cellar (4) the attic..... ( )
3. If you hurn your hand on the stove you should apply
   (1) cold water (2) salt (3) vaseline (4) vinegar..... ( )
4. If you see a house on fire the first thing to do is to
   (1) run for a policeman (2) notify the people at the house (3) run home and tell your parents about it (4) telephone home..... ( )
5. In case of a bad arterial cut on your wrist the tourniquet should be placed
   (1) between the cut and your fingers (2) between the cut and your shoulder (3) on the cut (4) on the finger..... ( )
6. The method that is best for reducing automobile accidents when it is slippery is to
   (1) drive slowly (2) watch the other fellow (3) drive rapidly (4) keep to the right of the road ..... ( )
7. The most important purpose for putting a piece of metal sheet under stoves is to
   (1) improve the appearance of the room (2) hold up the stove (3) protect the floor (4) keep floor clean ..... ( )
8. The substance that puts out the fire in the ordinary chemical fire extinguisher is
   (1) oxygen (2) carbon dioxide (3) hydrogen (4) nitrogen..... ( )
9. People should not leave their automobile motors running in closed garages because
   (1) it gets too stuffy (2) there is not enough air (3) it gets too hot (4) carbon monoxide gas is dangerous ..... ( )
10. The best way to prevent sidewalk accidents in icy weather is to use
    (1) boiling water (2) sawdust (3) salt (4) sand or ashes..... ( )
11. If you are driving a car in moving traffic and wish to turn to the right or left you should
    (1) blow your horn (2) stop your car (3) look back, slow down and signal with your arm (4) turn sharply to right or left..... ( )
12. The gas that is being used to replace hydrogen in dirigibles is
    (1) nitrogen (2) helium (3) illuminating gas (4) carbon dioxide..... ( )
13. Most automobile accidents are due to
    (1) intoxicated drivers (2) carelessness (3) lack of four-wheel brakes (4) blowouts.... ( )
14. The material used in the Pyrene fire extinguisher is
    (1) soda and water (2) sulphuric acid (3) carbon tetrachloride (4) carbon dioxide.... ( )
15. In order that water be made safe before it comes to our homes, in many cities it is
    (1) distilled (2) boiled (3) pasteurized (4) filtered..... ( )
16. If you should spill some acid on the floor or on your hand you should apply
    (1) lots of water (2) vinegar (3) butter (4) salt..... ( )
17. If you spill strong caustic or lye on your hand or on the carpet you should apply
    (1) lots of water (2) ammonia (3) soda (4) olive oil..... ( )
18. Milk is made safer before it comes to our homes by being
    (1) boiled (2) pasteurized (3) distilled (4) treated with preservatives..... ( )
19. The kind of moving picture films that should be used in school rooms without booths are
    (1) travel films (2) celluloid films (3) narrow films (4) non-inflammable films..... ( )
20. The number of people killed yearly by accidents in the United States is approximately
    (1) 25,000 (2) 1,000,000 (3) 90,000 (4) 500,000..... ( )
21. The kind of insurance that people take out to be paid them in case of personal injury is
    (1) accident insurance (2) compensation insurance (3) fire insurance (4) burglary insurance ..... ( )
22. Corrosive sublimate tablets should be kept
    (1) in the kitchen for quick use (2) on the pantry shelf (3) in the bedroom (4) under lock and key or out of reach..... ( )
23. A good emetic (which will cause someone who has swallowed poison to vomit) is
    (1) mustard and water (2) orange juice (3) vinegar (4) soap and water..... ( )
24. Which of the following may be used with safety in starting a fire in a stove?
    (1) kerosene (2) gasoline (3) excelsior (4) alcohol..... ( )
25. The best way to find out what the weather will be is to
    (1) consult almanacs (2) look at a weather vane (3) read Weather Bureau reports (4) read a thermometer..... ( )

PART 2

Read the following directions:

Below there are a series of questions. If you believe the answer should be "Yes" underline the "Yes" in the column at the side. If you think the answer should be "No" draw a line under the "No".

Do not hurry. Be sure you are right.

1. If your clothes catch on fire, is it best to run outdoors? ..... Yes No
2. Is it safe to hold small firecrackers in the hand? ..... Yes No
3. When walking along country highways should you walk on the left side? ..... Yes No
4. Does the individual have a right to disregard quarantine regulations if they seem too strict and interfere with his liberty? ..... Yes No
5. Is the Schaefer system of artificial resuscitation the best for reviving persons who have been almost drowned? ..... Yes No
6. Should the gas oven door be closed before the gas is lighted? ..... Yes No
7. Do Fire Underwriters insist on many electrical safeguards in house wiring so that the electrical companies may sell more products? ..... Yes No
8. Are school "Safety Patrols" useful in reducing accidents? ..... Yes No
9. If you know how to drive a motor vehicle should you drive a car if the state law does not permit it? ..... Yes No
10. Is it all right to go swimming in a lake alone if you are a good swimmer? ..... Yes No
11. Is the safest place in a thunder storm under a tree? ..... Yes No
12. Is the school fire drill a waste of time? ..... Yes No
13. Is it all right to play with a gun if you think it isn't loaded? ..... Yes No
14. Is there danger of spontaneous combustion of dry hay in barns? ..... Yes No
15. Do uniform traffic codes tend to reduce accidents? ..... Yes No
16. Are automobile accidents increasing in the United States? ..... Yes No
17. Should one look for gas leaks in the cellar with matches? ..... Yes No
18. May thermometers be used on ocean liners to inform the navigators of nearby icebergs? ..... Yes No
19. May a person driving a car be held responsible for injuries which he may cause to a pedestrian crossing the street? ..... Yes No
20. Should radio aerials be placed under high tension electric light wires? ..... Yes No
21. Are aviation beacon lights operated by the Department of Commerce? ..... Yes No
22. Are air brakes used on trolley cars? ..... Yes No
23. Is the number of accidents on railways increasing? ..... Yes No
24. Is fire the most important cause of airplane accidents? ..... Yes No
25. Is it advisable to take out fire insurance? ..... Yes No
26. Are all passenger carrying steamships inspected regularly? ..... Yes No
27. Is faulty construction the cause of most automobile accidents? ..... Yes No
28. In the Schaefer method of artificial respiration is the up stroke slow? ..... Yes No
29. Are cats used to show the presence of carbon monoxide gas in mines? ..... Yes No
30. Is it advisable to use rubber tubing for gas stoves? ..... Yes No

Rights ....

Minus Wrongs .....

Equals Score.. .....

PART 3

In the next series of questions you are to put yourself in certain life situations and tell what you would do or indicate what was wrong about the response to the situation made by other persons. Be sure you answer briefly and clearly.

Example: You are on a camping trip and after a campfire one of the boys says "Don't bother about the fire, it will go out anyway." What would you do?

Your answer here might naturally be "I would put the fire out."

Now give your answers or a statement about the problems below.

1. Frances wished to boil some potatoes for dinner, so she lit the gas and lay down for a while to sleep while the potatoes were cooking. What was the danger in doing this?.....
.....

2. As you are driving along the street in an automobile, suddenly you hear the siren of a fire truck behind you. What would you do?.....
.....

3.

You are at point A on a corner and wish to get to a drug store located at B as in the diagram. Draw with your pencil the best way to get to this point.

4. You stop at a garage to get gasoline and the garage man says to you "Shut off your engine." Why does he say thia? .....
.....

5. You are walking along the street and see a wire dangling from an electric light pole. What would you do?
.....
.....

6. In Fire Prevention Week you are given some home inspection blanks. Some of the other pupils say, "Oh, don't bother looking around about your house, just fill out the slip and pass it in to the teacher." What would you do?.....
.....

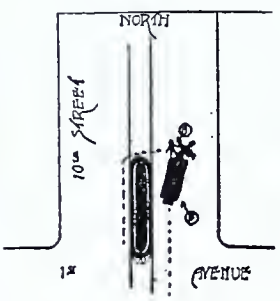
7. A fire breaks out in a nearby house. Where is exact location of the nearest fire alarm box?.....
.....If there isn't any box in your neighborhood, how would you get help?.....
.....
.....

8. You are a good swimmer and are at a camp on a lake. One of the other campers says to you, "Let's swim across the lake, nobody will notice us." What would you do?.....
.....

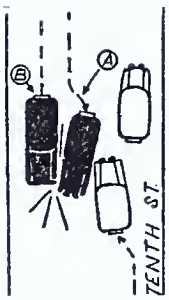
9. While you are in a boat rowing, suddenly the boat turns over in the middle of the lake. What would you do if you were a good swimmer?.....
.....

10. As you are coming to school, one of the children is suddenly taken with an epileptic fit. What would you do? .....
.....

11. You are playing basket ball and fall, spraining your ankle. What would you do to relieve the sprain?
.....
.....

12. 

A pedestrian steps off a street car and walks around the back of a car. As he steps from behind the car, he is struck by an automobile going 15 miles an hour in the opposite direction of the street car. Who is to blame and why? The dotted line indicates the path the pedestrian took and X is the point where the accident took place.....
.....
.....
.....

13. 

A man A is driving along an avenue and drives for some time behind another car B going at 15 miles an hour. A has an opportunity to pass B, signals with horn, speeds up to 20 miles an hour and starts to pass. In the meantime B also speeds up his car to prevent A from passing him and another car approaches, forcing A into an accident with B's car. A had followed B for some time and the road appeared clear ahead. Without going into the question of motor vehicle laws, which car do you think is at fault?.....

14. After school you see some children playing around a bonfire, taking turns running through the fire. What would you do?.....

15. While you are coming to school, you see a small boy enjoying himself climbing up an electric light pole. What would you do?.....

16. If one of the children in your home should accidentally swallow some carbolic acid, what would you do?

17. A boy, while playing, is pushed through a window, cutting himself severely at the elbow. What would you do first? .....

18. You are driving through the country and suddenly see a small fire, which has been started by a freight train. What would you do?.....

19. You are a good swimmer and while bathing at the lake notice a person 100 feet from shore calling for help. There are several boats on the shore, but no life guard. What would you do?.....

20. It is necessary to park an automobile on a street which has a very steep grade. How would you do this?

21. How would you safeguard yourself so that, in case your automobile injured a person, you would be protected from damage suits? .....

22. What is the danger from cutting off the forests near the headwaters or the sources of rivers?.....

23. If bitten by a snake, what is the first thing you would do to treat yourself?.....

24. How do you use the "Tired Swimmers Carry?" .....

25. What is the greatest danger from cuts and wounds not properly treated?.....

Score—Right Responses × 2.....

PART 1

1. (1)
2. (1)
3. (3)
4. (2)
5. (2)
6. (1)
7. (3)
8. (2)
9. (4)
10. (4)
11. (3)
12. (2)
13. (2)
14. (3)
15. (4)
16. (1)
17. (1)
18. (2)
19. (4)
20. (3)
21. (1)
22. (4)
23. (1)
24. (3)
25. (3)

SCORING SHEET NATIONAL SAFETY TEST—FORM ALPHA

PART 3

In Part 3 there are provisions for a free response on the part of pupils. However, the essential part of the answers below must be contained in their response before credit is given on the question. Give no partial credit. The answer involves a knowledge of the hazard and a satisfactory solution. One of the answers given below is sufficient. Ideas or words giving the same meaning are to be accepted.

1. *Gas* might be *extinguished* by kettle boiling over and girl might be *asphyxiated.* (No credit for "potatoes might be burnt.")
2. Slow up and pull over to right—Pull up to the *curb—Stop car* so that fire apparatus will have room to pass. (One of these or others of similar content are acceptable.)
3. The diagram should show the path taken by the pupil as crossing the street, turning to the right, or left, and then crossing to the drug store.
4. *Gasoline* might be *ignited*—There is *danger* of gasoline *catching* on *fire—Gasoline* might *ignite* from the exhaust. (Any one answer is correct.)
5. *Leave* it *alone*—Tell others to *leave* it *alone* and leave it alone yourself—*Leave* it *alone* and notify a policeman.
6. I would *inspect* my house and *fill out* the blank—I wouldn't do what one of the pupils said, but would do the right thing and inspect my house and fill out the blank.
7. The fire alarm box is.....
   I would telephone or tell someone in a house nearby to telephone. (One answer must be given.)
8. I would *not swim* across the lake.
9. I would *hang* on to the boat—I would stay by the boat until help came or would call for help—I would *hang* on the boat and push it toward shore.
10. I would *keep* the *child* from *hurting* itself and have someone *call* a *doctor* or *call* a *doctor* myself.
11. I would apply *hot* or *cold* water—I would soak in *hot water*—I would apply *alternately hot* and *cold* water.
12. *Pedestrian* is to blame for he should be *careful* about coming out from *behind trolley cars.*
13. B is at fault.
14. I would *stop* them—I would tell them to *stop* or have someone *stop* them.
15. I would *tell* him to *come* down—I would *tell* someone else to *make him come down.*
16. Call a *doctor* and give an *emetic.* (Give them something to make them vomit—mustard and water, salt and water, white of egg.)
17. Apply a *tourniquet* to stop bleeding—Apply *tourniquet* between *elbow* and *shoulder.*
18. *Put* it out if I *could—Put* it *out* if possible or *notify* someone living along the road.
19. Get the *boat* and *row* to person. (Not swim to drowning person.)
20. (a) Put on *brakes* (b) turn *wheels* against *curb* (c) *Block* wheel with *large stone* or brick (d) put *car* in *gear.* (Two methods should be given here.)
21. I would take out *insurance.*
22. Dangers of *floods* in the spring—Forests hold moisture and prevent bad floods after heavy rainfalls or spring freshets.
23. Apply tourniquet and suck wound if possible—Apply tourniquet, suck wound and call doctor—Apply tourniquet and get patient to a doctor.
24. *Tired* swimmer *rests* on *back* placing *hands* on *your shoulders* and you *swim* using *breast stroke* pushing tired person ahead.
25. Danger of *infection*—Danger of *blood poisoning.* (No credit for "danger person will be sick.")

PART 2

1. No.
2. No.
3. Yes.
4. No.
5. Yes.
6. No.
7. No.
8. Yes.
9. No.
10. No.
11. No.
12. No.
13. No.
14. No.
15. Yes.
16. Yes.
17. No.
18. Yes.
19. Yes.
20. No.
21. Yes.
22. Yes.
23. No.
24. No.
25. Yes.
26. Yes.
27. No.
28. No.
29. No.
30. No.

USES OF THE TEST FOR DIAGNOSTIC PURPOSES

Teachers or administrators, who wish to determine through using the test, where special stress is needed in safety education or where the best work is being done, may use the following analysis. There are in all eighty test questions and these are divided as follows:

	Part 1	Part 2	Part 3	Total
1. Motor Vehicle Safety	1, 6, 11, 13	3, 9, 15, 16, 19, 27	2, 12, 13. 20	14
2. Fire Prevention	2, 4, 7, 8, 14, 19, 24	1, 7, 14, 17	4, 6, 7, 14, 18	16
3. Home Safety	9, 18, 10	2, 13, 20, 30	1, 6	9
4. Public and Industrial Safety	10, 12, 15, 20	4, 10, 11, 21, 22, 23, 29	3, 5, 8, 9, 15, 19	17
5. First Aid	3, 5, 17, 16, 22, 23	5, 28	10, 11, 17, 25	12
6. General Safety	21, 25	12, 18, 24, 25, 26, 3	21, 23, 24, 22	12

DISTRIBUTION OF SCORES

Having scored tests and indicated the total scores on the first page of the test blanks, the following directions are given for filling out the distribution table below. Use a separate sheet for each grade. Check each score in the column provided. Find totals for various ages and step intervals on the distribution. Indicate the mean score (arithmetic average) for the grade. Check one of the following:

1. These pupils have had special safety education instruction in the grades.....
2. These pupils have not had special instruction in safety but instruction has been rather incidental to work in other subjects.....

.....

School..... City.....

Grade..... Date tested..... Scored by.....

DISTRIBUTION TABLE

AGE SCORE—DISTRIBUTION

Scores	9–10	10–11	11–12	12–13	13–14	14–15	15–16	16+	Total
105–109									
100–104									
95–99									
90–94									
85–89									
80–84									
75–79									
70–74									
65–69									
60–64									
55–59									
50–54									
45–49									
40–44									
35–39									
30–34									
25–29									
20–24									
Totals									

Mean Score for Grade_____

It should be borne in mind that although we are interested in this test in determining pupil knowledge and attitudes in regard to safety, the most important purpose is to provide a method of determining where pupils do not recognize the hazards concerned and of motivating them to practise the safety lessons involved. In order to do this, test blanks, after being scored, should be returned to pupils and pupils should note the corrections. In this way the test may be used for teaching purposes and getting a group acceptance of general safe practise that is involved in the protection of life, health and property.

The National Bureau of Casualty and Surety Underwriters would like to have one copy of the distribution table for each grade returned to the Education Division, National Safety Council, 1 Park Avenue, New York City, so that grade norms, T scores and other standards may be established. Temporary standards for the test by grades are available at the present time.

Appendix B

TABLE XLVII

Activities of Steamboat Inspection Service in 1928*

Activities	Number
Certificates of inspection issued to steam and motor vessels	7,118
Steam vessels granted letters of approval	527
Government vessels and boilers inspected	2,098
Cargo vessels examined	1,044
Marine boiler plates tested	2,961
Steel bars tested	234
New life preservers inspected	150,555
New life saving apparatus inspected at factories	8,925
Number of persons licensed by service	21,823
Foreign passenger motor vessels inspected	21
Certificate of service issued to able seamen	7,944
Certificate of efficiency issued to lifeboat men	6,721
Lives saved by means of life saving devices	419
Vessels refused certificates of inspection	72
Defects in boilers and attachments	97,832

* From the Annual Report of the Steamboat Inspection Service, 1928.

TABLE XLVIII

Safety Work of the United States Lighthouse Service*

Activities	Number
Lights (other than minor lights)	1,879
Minor lights	3,055
Light vessel stations	49
Gas buoys	638
Float lights	178
Total Lighted Aids	5,799
Fog signals	544
Radio fog signals, submarine signals	53
Whistling buoys and bell buoys	320
Other buoys	7,204
Day beacons	2,453
Total Unlighted Aids	10,574
Lighthouse vessels (tenders)	56
Employed staff of service	5,985
Disabled vessels assisted	94
Rescued persons	12
Other forms of assistance (furnishing food, recovering property, etc.)	20

* From the United States Lighthouse Service Report of 1923.

TABLE XLIX

SUMMARY OF ACTIVITIES OF THE UNITED STATES COAST GUARD IN 1927*

Activities	Number
Lives saved or persons rescued from peril	3,313
Persons on board vessels assisted	14,496
Persons in distress cared for	899
Vessels boarded and papers examined	68,223
Vessels seized or reported for violations of law	1,788
Regattas and Marine parades patrolled	39
Instances of lives saved and vessels assisted	2,791
Instances of miscellaneous assistance	2,717
Derelicts or other obstructions to navigation removed or destroyed	136
Persons examined for certificates as life boatmen	4,617
Fines and penalties incurred by vessels reported	$375,069.00
Value of vessels assisted (including cargoes)	$37,801,357.00
Value of derelicts recovered and delivered to owners	$120,290.00
Number of cruisers, patrol boats, picket boats, etc., in the Coast Guard service	458
Number of active Coast Guard stations	252
Personnel of Coast Guard, including officers, cadets and enlisted men	11,240

ACTIVITIES OF THE UNITED STATES FOREST SERVICE†

Branch of Forest Management: Directs sale, marking and cutting of timber in the National Forests.

Branch of Leasing: Supervises the allotment of areas for the grazing of animals in National Forests.

Branch of Lands: Classifies the various kinds of land with forest areas, conducts dam cases, provides recreational facilities, and supervises sales.

Branch of Research: Handles investigations and experimental work.

Branch of Engineering: Directs surveying and mapping, supervises construction and gives water power permits.

Branch of Public Relations: Directs publicity work, issues bulletins and aids in dissemination of knowledge of forests.

SPECIAL ACTIVITIES

Forest fire prevention and fighting fires.

Constructing public camp grounds.

Building permanent improvements on areas.

Investigating forest products.

Fighting insect and plant enemies to forests.

* From the "Annual Report of the United States Coast Guard," 1927. This does not include the report of work done in the Mississippi River flood relief.

† Adapted from Moon and Brown, *Elements of Forestry.*

TABLE L

ACTIVITIES OF THE NATIONAL SAFETY COUNCIL

Activity	Number
Assisting in formulation of 55 national safety codes	
Organized local safety councils	59
Number of corporations, firms, and individuals who are members	5,200
Publications:	
"National Safety News"—Monthly circulation	14,500
Number of illustrated bulletins originated	5,800
Number of bulletins sent out in 1928	8,000,000
"Public Safety Magazine"—Monthly circulation	8,000
Number of safe practices pamphlets originated	99
Releases to newspapers and magazines, number of newspapers yearly	2,000
Education Division:	
Circulation of "Safety Education Magazine"	8,500
Circulation of monthly lesson plans	30,000
Booklets and pamphlets published on safety education	20
Educational staff for consultation, field work, preparing materials, etc.	4

General:

National Safety Congress—held once a year. Attendance 6,000; number of speakers 300; number of sessions 120.

Collecting statistical data from 100 cities, all states, insurance companies, industries, state departments of motor vehicles, etc.

Consulting service to many local and national safety agencies and to industries, police departments, etc.

Number of regional safety conferences held—22.

Number of persons in headquarters staff—103.

Appendix C

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VITA

Herbert James Stack was born in Orange, Massachusetts, March 29, 1892. He received his elementary school education in the schools of that town and was graduated from Amherst, Massachusetts, High School in 1908. He later received his bachelor's degree from Massachusetts Agricultural College and enrolled as a graduate student at Yale University. Subsequently he took graduate work at the University of Pittsburgh, Pennsylvania State College, and Teachers College, Columbia University.

From 1912 to 1917 he taught in the high schools in Wallingford and Bridgeport, Connecticut, and in 1920 was made principal of the Bridgeport High School Annex, continuing in this school for three years. From 1923 to 1929 he was supervisor of secondary schools in Johnstown, Pennsylvania. He has taught in the summer session at Indiana (Pennsylvania) State Teachers College, George Peabody College for Teachers, Pennsylvania State College, and Teachers College, Columbia University, in addition to teaching in extension for the University of Pittsburgh and Pennsylvania State College. In 1929-30 he was the holder of the research fellowship in safety education at Teachers College, Columbia University. At the present time he is Associate Professor of Education at Pennsylvania State College. He is the author of several articles including, "Articulation and Correlation in the Secondary Schools," *Educational Administration and Supervision,* Feb., 1925, No. 2, pp. 104-111, and "Organizing Your Community Study," *The Historical Outlook,* Nov., 1928, pp. 335-337. In addition he is the author of four tests in science and civics, two of which were published in *School Science and Mathematics,* Nov., 1927, Vol. XXVII, pp. 854-862, and two others in *The Historical Outlook,* Apr., 1927. He is also the co-author of *First Steps in Curriculum Building,* a publication of the Johnstown (Pennsylvania) Public Schools.